2004 ANNUAL REPORT OF THE

MAINE ATLANTIC SALMON COMMISSION

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COMPILED AND EDITED BY:

Patrick Keliher
Executive Director

SALMON COMMISSION BOARD MEMBERS

Richard Ruhlin
At-Large, Public Member
Chairman

Commissioner George Lapointe
Maine Department of Marine Resources

Commissioner R. Dan Martin
Maine Department of Inland Fisheries and Wildlife,

This report details the annual work of the Maine Atlantic Salmon Commission. All data contained within this report is believed to be conclusive, however much of the commissions work remains "in progress" and as such changes may occur. Questions about this information should be referred to the Commission's Augusta, Maine office.

MAINE ATLANTIC SALMON COMMISSION

ASC, Augusta Office
323 State Street
172 State House Station
Augusta, Maine 04333
(207) 287-9972 Fax (207) 287-9975

ASC, Bangor Office
650 State Street
Bangor, Maine 04401
(207) 941-4449 Fax (207) 941-4443

ASC, Sidney Field Office
27 Lyons Road
Sidney, Maine 04330
(207) 547-5326 Fax (207) 547-4035

ASC, Jonesboro Office
Route 1A, PO Box 178
Jonesboro, Maine 04648
(207) 434-5920 Fax (207) 434-5923

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Introduction

2004 has brought about a sea-change at the Maine Atlantic Salmon Commission (ASC). As the lead entity in Maine Atlantic salmon recovery, the Commission is positioning itself to create change as we address new and old threats to wild Atlantic salmon.

With the recent release of the National Academy of Science report, *Atlantic Salmon in Maine* (NAS Report), as well as the release of the Federal Recovery Plan (FRP) for Atlantic salmon, a new commitment to approaching the recovery of the last runs of wild Atlantic salmon in the United States has begun. The "same old same old" of the past has not worked and populations have diminished in many areas, but at the same time a new optimism has been created as we see small gains in key rivers like the Penobscot.

The people of Maine have lost contact with this National Treasure -- *The people of Maine must be reconnected to this great fish*. No longer can the public travel to the first set of falls on a river during peak migrations to see a fish navigate up a stretch of river by leaping over a seemingly impossible obstacle. Anglers do not use the benches and rod racks along our salmon rivers, instead are unused, awaiting restored runs. It is this loss of personal connection with the fish that is so troubling. It is this loss that drives the Commission to restore runs of wild Atlantic salmon.

Populations of Atlantic salmon throughout Maine remain at critically low levels. If the Commission is to be successful, we must continue our efforts and partnerships with the National Oceanic and Atmospheric Administration, Fisheries Division (NOAA Fisheries), US Fish and Wildlife Service (USFWS), as well as all of our local partners. We must look "outside the box", find and develop new science, and create compromise when we find disagreement with our partners. We must address the threats that are causing the continued decline of Atlantic salmon.

This past year the Commission began a comprehensive planning process that will address the future. We are well underway in the development of a new 10-year strategic plan that will guide our recovery efforts throughout Maine. All to often plans are never completed for one reason or another – they find a shelf and collect dust. The Commission is committed to a new approach and in doing so is not just putting down ideas, rather is looking forward at future needs and areas of concern to address, while setting realistic goals and establishing objectives that take us from population declines to increases.

Data collected over the past two and three decades is connecting species recovery to the health of the river and riparian habitat. It is an ecosystem approach that will ultimately save this species from extinction. It is no longer enough to focus solely on the fish. Biologist need to understand the relationships Atlantic salmon have to water temperature, pH levels, forest practices, road crossings, and changes to the rivers from past land-use practices (just to name a few). We have learned that it is not enough to just put juvenile fish in the water and hope they return as adults. While hatcheries will remain a key part of short-term restoration, the long-term goal is to see self-sustaining runs of salmon that do not need human intervention.
This sea-change brought fourth in 2004 will shape the Commission's activities for the next 10 years. We believe that this new approach will benefit the species as a whole, which in return will benefit the people of the State of Maine.

Pat Keliher
Executive Director

EXECUTIVE SUMMARY

Legislative Mandate

Maine State Statute established the Maine Atlantic Salmon Commission in 1999 [C.401, Pt. BB, § 8 (amd).]. This law replaced earlier legislation that formed the Maine Atlantic Sea-Run Salmon Commission in 1947 and subsequently the Atlantic Salmon Authority in 1995. The 1999 legislation structured the Commission with a three-member board comprised of the Commissioners of the Maine Departments of Inland Fisheries and Wildlife and Marine Resources and a third, at-large, member appointed by the Governor and subject to confirmation by the Senate. The Salmon Board appoints an Executive Director who is, in turn, responsible for hiring and managing all other Commission staff (see Title 12, Chapter 811: GENERAL PROVISIONS (HEADING: PL 1995, c. 406, @12 (new))

Purpose

The purpose of the Commission is to protect, conserve, restore, manage and enhance wild Atlantic salmon habitat, populations and sport fisheries within historical habitat in all waters (inland and tidal) of the State of Maine.

Management Focus

The Commission is responsible for Maine's Atlantic Salmon Conservation Plan (ASCP). Atlantic salmon habitat protection and enhancement programs are managed under the auspices of the ASCP. However, the ASCP will need to be amended in the near future to address changes in the threats and priorities.

The ASCP has been fashioned in the context of Maine's current comprehensive regulatory framework to protect salmon and its habitat, as well as a general scientific consensus that several driving forces in the decline of this species are beyond the jurisdiction of the State of Maine. The ASCP is designed to assure that Maine has taken all reasonable steps to assure successful restoration of wild Maine Atlantic salmon.

On a parallel track to Maine's ASCP is the Federal Conservation Plan, currently awaiting approval at the Department of Interior and the Department of Commerce. Upon approval, the Commission's staff and Board will review and determine the best management focus for the Maine plan to ensure that duplication is avoided and the individual plans compliment each other. The Maine Atlantic Salmon Conservation Plan will remain the Commission's operative guideline.

Partnerships

The Commission, to successfully achieve is mission, works side-by-side with local, state, national and international organizations and agencies to manage Maine' wild Atlantic salmon. The following are the primary agencies and non-governmental organizations that the Commission works with on a day-to-day basis:

State:
Marine Resources
Inland Fisheries and Wildlife
Agriculture
Environmental Protection
Transportation
Conservation
State Planning Office
Public Utilities Commission

Federal:
US Fish & Wildlife
National Marine Fisheries
U.S. Army Core of Engineers
U.S Environmental Protection Agency
U. S Geological Survey

International:
North Atlantic Salmon Conservation Organization
International Joint Commission - St Croix Board
International Council for the Exploration of the Sea

Tribal:
Penobscot Indian Nation
Passamaquoddy Indian Nation

Non-Governmental Originations: *
Atlantic Salmon Federation – Maine Council
Atlantic Salmon Unlimited
Coastal Mountain Land Trust
Downeast Salmon Federation
Fish Friends
Fishing in Maine
Friends of the Kennebec
Kennebec Chapter of Trout Unlimited
Maine Rivers
Passamaquoddy Indian Nation
Penobscot Indian Nation
Penobscot Fly Fishers
Penobscot Riverkeepers 2000
Pleasant River Fish & Game Conservation Assoc.
Pleasant River Hatchery
Project SHARE
Sheepscot Valley Conservation Assoc.
St. Croix International Waterway Commission
Trout Unlimited – Maine Council
St. Croix International Atlantic Salmon Assoc.
Union Salmon Association
Downeast Lakes Land Trust
Merry Meeting Bay Chapter TU
Ducktrap Coalition
Cove Brook Watershed Council
Dennys River Watershed Council
E. Machias Watershed Council
Machias Watershed Council
Narraguagus Watershed Council
Pleasant River Watershed Council
Sheepscot River Watershed Council
8 Rivers Roundtable
Dennys Sportsman's Club
Eddington Salmon Club
Penobscot Salmon Club
Saco River Salmon Club
Veazie Salmon Club
Nation Fish and Wildlife Foundation
University of Maine System
Wild Blueberry Commission
Ducktrap Coalition
Narraguagus Salmon Association
Pleasant River Fish & Game Conservation Assoc.
Union River Watershed Council
Quoddy Regional Land Trust
Washington County SWCD
Atlantic Salmon for Northern Maine
Belfast Bay Coalition

Non-Governmental Organizations (Cont.)

Sheepscot Wellspring Land Alliance
Kennebec County SWCD
Sheepscot River Salmon Club
Georges River TU
Penobscot Partners
Penobscot F.I.S.H.
Penobscot River Coalition
Wild Blueberry Commission
The Nature Conservancy
Forest Society of Maine
Branch Pond Association
Knox-Lincoln SWCD
Waldo County SWCD
Cove Brook Watershed Council
Eddington Salmon Club
Northern Penobscot Salmon
University of Maine
Commission Advisory Panel
Maine Coast Heritage Fund

**All attempts were made to include all our partners. If any one was left out of this list please do not hesitate to contact the Commission.*

Funding

The Atlantic Salmon Commission is supported by several funding sources that enable it to focus on its mission of restoring wild Atlantic salmon:

General Fund Appropriation
FY 2004 (July 1 to June 30) $634,378

General fund appropriations support the monitoring, management, and enhancement activities of the Commission.

> Recent adjustments to the Commission's budget resulted in a total loss of $40,278. This reduction included the loss of a critical staff position that supported our land and habitat conservation program and directly affected the Commissions' support of local Watershed Councils and a grant program that matched valuable Federal dollars.

National Oceanographic and Atmospheric Administration Grant (NOAA)
FY 2004 $1,180,000

> The Commission, in collaboration with NOAA, assesses adult and juvenile populations, evaluate various stocking practices, study adult and smolt migration, and monitor water quality in Maine salmon rivers. Funds from the NOAA grant support staff and equipment that allow the Commission to continue this work.

Kennebec River Restoration Account
FY 2004 $30,000

> Annual contributions from the KHDG agreement have enabled the Commission to monitor salmon activities and habitat on Maine's second largest River. The funds from this account are slated to expire in 2010.

The current annual budget for the Commission is $1,870,588. The State of Maine's General Fund Contribution makes up 41 percent of the Commission's annual budget.

ATLANTIC SALMON STOCKING PROGRAMS

The ASC has the responsibility for all Atlantic salmon stocking in Maine waters. The Commission does this in cooperation with two US Fish and Wildlife Service salmon hatcheries: Craig Brook National Fish Hatchery and Green Lake National Fish Hatchery. These hatcheries receive Atlantic salmon collected by the ASC from wild populations in Maine and hold or raise them for use as broodstock. Progeny of these fish are stocked by ASC at different ages.

The current salmon stocking program in Maine uses river-specific fish. Each river receives progeny of fish previously collected from the same river. This protocol is followed on the Sheepscot, Dennys, Narraguagus, Machias, East Machias, and Penobscot rivers. Atlantic salmon restoration in the Saco, Union, and St. Croix rivers is based on Penobscot River origin fish. At Craig Brook there are separate rooms where captured parr or smolts from the Downeast rivers are held through maturity when they are spawned. The embryos are reared to stock back into their natal rivers as fry, parr, or smolts. The adult fish are used as egg producers for one or more years, after which they too are returned to the rivers as kelts. The Penobscot River is the only river where eggs are taken from returning adults in addition to captive reared broodstock. Fry were the most numerous life stage of Atlantic salmon stocked into Maine rivers in the year 2004 (Table 1).

Table 1. Summary of Atlantic Salmon Stocked in Maine in 2004 from USFWS hatchery broodstock, Fish Friends programs, St. Croix IWC, Dug Brook Hatchery, and Saco Hatchery *.

River	Fry^	0 Parr	1 Smolt*	2 Smolt	Adult	*Totals*
Aroostook	1,500	-	-	-	50**	1,550
Dennys	216,300	44,000	56,300	-	323	316,923
East Machias	316,200	-	-	-	97	316,297
Machias	382,000	-	-	-	409	382,409
Narraguagus	465,800	-	-	-	291	466,091
Penobscot	1,796,000	369,000	566,000	-	1,492	2,732,492
Pleasant	47,400	-	-	8,800	101	56,301
Sandy	50,400	-	-	-	-	50,400
Saco	372,400	-	-	-	-	372,400
Sheepscot	289,800	15,600	-	-	116	305,516
St. Croix	-	2,800	4,000	-	-	6,800
Totals	3,937,800	431,400	626,300	8,800	2,829	5,007,129

Note: Values for Fry, 0 Parr, 1 Parr, 1 Smolt and 2 Smolt are rounded to the nearest 100
^ Fry values include Fish Friends and Salmon-in-School program fry; fry values are also adjusted for mortality occurring during stocking
** 1 Smolt values include prorated "spring parr"*
*** These fish were captured on the St. John River and released into the Aroostook River as per standing agreements with DFO – Canada.*

Adult Atlantic salmon are collected by the ASC at a trapping facility in the Veazie Dam on the Penobscot River throughout the spring and summer season. The fish are held at Craig Brook until sexually mature, stripped and the embryos incubated. Some are sent to Green Lake where they will be raised either to the parr stage or the smolt stage for stocking into the Penobscot River. More than 500,000 smolts were stocked in the Penobscot River in spring 2002 (Table 1). Under our cooperative agreement with the USFWS, about 50,000 smolts per year are sent to New Hampshire to support restoration efforts in the Merrimack River. Penobscot River eggs are

also used to produce fry that will be stocked into various upstream reaches of the watershed where they will grow two years before they will migrate to the ocean as smolts.

In addition to the USFWS hatcheries there are three satellite hatcheries operated by non-governmental Atlantic salmon organizations; Union River, Saco Salmon Club, Atlantic Salmon for Northern Maine. The Union and Saco Hatcheries receive embryos from the Penobscot captive broodstock at Green Lake. Atlantic Salmon for Northern Maine receives embryos from St. John River stock spawned In Canada. These are reared and stocked in the Aroostook River. The Federal hatcheries also provide eggs to schools as part of an educational program called Fish Friends that integrates the task of rearing and stocking Atlantic salmon fry into the science curriculum.

Fry stocking on Ossipee River

RESEARCH AND MANAGEMENT

The Atlantic Salmon Commission (ASC) staff conducts routine monitoring of the abundance and status of juvenile and adult salmon (Table y) in most of Maine's Atlantic salmon watersheds. ASC staff operates traps to monitor adult Atlantic salmon returns on the Penobscot, Narraguagus, Pleasant, and Dennys Rivers. Great Lakes Hydro, America operates a trap in the upper Penobscot drainage, Pennsylvania Power and Light operates one on the Union River, Florida Power and Light operates traps and lifts on the Saco River, DMR operates one on the Androscoggin River, and the St. Croix Waterway Commission operates one on the St. Croix. Redd counts (Table z) are used to track spawning escapement.

Research

Research on Atlantic salmon is directed at determining the causes of the precipitous decline in Atlantic salmon returning to Maine waters. Ongoing ASC research projects are aimed at determining survival among freshwater life stages and understanding the biological and environmental factors affecting survival. NOAA-Fisheries salmon research focuses on the same questions in estuarine and marine waters. The two agencies conduct cooperative research designed to link freshwater rearing conditions and smolt emigration to better understand the biotic and abiotic factors affecting the freshwater-marine transition. Components of the cooperative projects are currently underway on the Pleasant, Narraguagus, Dennys, and Penobscot Rivers. These include: parr density and growth, basin-wide estimates of large parr; indices or estimates of smolt emigration smolt; smolt physiology, marine and estuarine smolt trawling, and smolt tracking through estuaries. As part of this collaborative effort, ASC is working with the Mitchell Center at the University of Maine to monitor water quality within Downeast rivers. ASC staff is measuring cobble embededness in juvenile rearing habitat and permeability in spawning habitat to evaluate the relative quality of these across Maine salmon rivers. The water quality and habitat work are important background for further studies of over-winter parr survival and smolt physiology.

Hydrology

ASC is investigating the effects of physical habitat and hydrology on juvenile salmon survival. As part of this effort ASC is working with USGS to gage Atlantic salmon rivers and increase the data available to link hydrology, habitat, and juvenile production and survival. USGS is also conducting analyses of historic data to determine if the timing and duration of summer and winter low flow periods has changed over the last century. The Maine Atlantic Salmon Commission, working with Kleinschmidt Energy and Water Resource Engineering of Pittsfield Maine, and Sevee and Maher Engineers, Inc. of Cumberland Center Maine recently completed a catalog of existing ground and surface water, geologic, habitat, and climatic data within these watersheds and an assessment of the potential surface-water and ground-water (SW-GW) watershed models. These models may prove valuable tools for assessing the effects of surface-water and groundwater withdrawals, and the land use/land cover changes on river flows, groundwater, and salmon habitat within portions of the rivers.

Migration

USGS (United States Geological Service) Conte Anadromous Fish Research Lab completed the fieldwork on a collaborative project with ASC, PIN (Penobscot Indian Nation), NOAA-Fisheries, and the University of Maine, on documenting the upstream migration of adult Atlantic salmon in the Penobscot River. The research used Passive Integrated Transponder (PIT) tag technology to gather data on movements of individual adult salmon that can be used to evaluate upstream movements and distribution of salmon within the drainage, the probability that fish are able to access spawning habitat, broodstock management, and the effectiveness of current juvenile stocking practices.

WATER QUALITY REPORT

The Maine Department of Environmental Protection (DEP) and volunteers from the Sheepscot, Ducktrap, Narraguagus, Pleasant, Machias, East Machias, and Dennys Rivers, Cove Brook, and Tunk Stream watershed councils have collaborated on water quality monitoring in Maine salmon rivers since 1999. In 2004, monitoring concentrated on the Pleasant River, the Narraguagus River, and on Tunk Stream. There were two goals: (1) to document low pH episodes in these rivers during high flow events, and (2) to provide thermal and water quality profiles of selected tributaries in from June to September.

Low pH episodes in Maine rivers and streams are caused by both natural and anthropogenic (humans) conditions. Natural causes include dilution of base cautions (buffering capacity) during high flows, organic acidity (from bogs and peat lands), and sea salt spray in coastal inland waters (sea salts displace and release hydrogen ions from soils). Human causes are from industrial gaseous emissions, including sulfur dioxide (SO_2), nitrogen oxides (NO_x), ammonia (NH_3), and particulate emissions from the mid-west, which ultimately fall on Maine watersheds in the form of acid rain. Precipitation in Maine typically has a pH of 4.8-5.0.

Volunteers monitored water chemistry (pH, dissolved oxygen, and temperature) on a weekly basis. Within the Pleasant River drainage, water samples were taken from West Little River and Little River (East Little River). Less regularly, samples were taken at Saco Falls, Crebo Crossing, the outlet of Pleasant Lake, and from Canoe Brook. Temperature data loggers were put in Canoe Brook, Gosha Brook, Ingersol Brook, Taylor Branch, Western Little River, and (East) Little River. In addition, pH, dissolved oxygen, temperature and, specific conductance observations from a data logger at the Wild Salmon Resources Center (WSRC) are available on line (www.mainesalmonrivers.org). The WSRC, the data logger, and the website are owned and maintained by the Downeast Salmon Federation.

Water quality samples were collected from the Narraguagus drainage from the West Branch at Sprague Falls, the mainstem in Cherryfield and at Little Falls, Mill Stream, Cranberry Brook, Lawrence Brook, Schoodic Brook, Great Falls Branch, and McCoy Brook. Temperature loggers were placed in Thirty-five Brook, Humpback Brook, Great Falls Branch, and Schoodic Brook at the Schoodic Lake outlet and at Route 193, and Lawrence Brook to characterize daily and seasonal fluctuations in temperature.

In addition, data loggers were deployed in outlet of Spring River Lake and in Downing Bog Stream in the Tunk Stream drainage from August to December. These loggers were equipped with probes to record pH, specific conductance, water temperature, and dissolved oxygen. There was also a temperature logger in Downing Bog Stream.

The summer of 2004 was cool and wet with stream flows well above normal for July, August, and September. On August 13, the remnants of hurricane Bonnie made landfall in Maine. Many coastal communities received 2 - 4.5 inches of rain in a 24- hour period. Other un-named tropical storms arrived at almost weekly intervals through September 9. Monitoring at Columbia Falls showed this series of large storms affected the pH of the Pleasant River. In August, hurricane Bonnie caused pH to drop to 4.65 the day after the storm. The successive storms resulted in 17 consecutive days when the pH was below 6.0 in the Pleasant River during

this period. From November 29 to December 7 more rainfall resulted in another 8 days between pH 4.65 and 5.0.

On the Narraguagus River the lowest pH were also observed during the high flows associated with the tropical storms and significant rain events of the late summer and fall. In 2004, the lowest pH observed by the volunteers for the West Branch was 4.8, observed on August 22 after the hurricane passed through. PH depressions were also observed in the mainstem and in the other tributaries during the high flow periods following these rain events.

Downing Bog Stream in the Tunk stream drainage had pH ranging from 5.32 to 5.63 from September 23 to November 12, with the lowest value on September 23 after a rainstorm of 1.3 inches. Field pH measurements at other sites in all three drainages also detected low pH associated with storm events.

Under the state's water quality classification program, Class AA waters are expected to have at least 7 mg/L dissolved oxygen and/or 75% oxygen saturation. These standards represent important physiological thresholds for maintaining salmon survival. Most of the tributaries met these criteria. On several occasions during the extreme hottest days of the summer, oxygen saturation less than 75% was recorded in Schoodic Brook, Lawrence Brook and Humpback Brook in the Narraguagus drainage and the outlet of Spring River Lake and Downing Bog Stream in the Tunk Stream drainage. However these low seasonal dissolved oxygen values occurred naturally, and are therefore not considered a violation of state water quality standards. At higher flows in August, all these tributaries had DO values above critical thresholds.

The cool, wet summer provided favorable river temperature conditions for salmon in Maine rivers in 2004. Maine rivers and streams increase in temperature during the day and then cool off at night. Passing weather systems, and extended cool or warm/humid conditions can greatly influence this typical pattern. Atlantic salmon become stressed when temperatures exceed 22.5°C (72.5°F), and may alter normal feeding and behavioral patterns. Juvenile salmon populations exposed to temperatures greater than 27°C (80.6°F) for extended periods of time may experience some mortality. Of the nine tributaries sampled across the Pleasant and Narraguagus Rivers, and Tunk Stream, only the outlet on Schoodic Lake and Lawrence Brook in the Narraguagus drainage had days where the minimum temperature did not go below 22.5°C (4 days and 7 days, respectively), and only Schoodic Brook at Route 193 and Lawrence Brook had observations above 27°C (5 days and 3 days, respectively).

Key Restoration Projects
Examples of Project Scale

THE AROOSTOOK RIVER ATLANTIC SALMON RESTORATION PROGRAM

The Aroostook River is located in northern Maine and is a tributary to the Saint John River in New Brunswick, Canada. It is Maine's 4th largest river with a mainstem 106 miles long and has over 1,600 miles of tributary streams and rivers. Surveys of the river conducted in the 1950's by the Maine Dept. of Inland Fish and Wildlife (MDIFW) revealed an abundance of high quality habitat for Atlantic salmon and other cold-water species. Accurate records on the historic (pre-dams) abundance of salmon in the Aroostook River are not available, but based on current habitat estimates the river could produce runs of 2,000 – 6,000 adult salmon. Construction of the Tinker Dam on the lower Aroostook River in 1906 completely obstructed the river to migrating salmon and they quickly disappeared. A fishway was added to the dam in 1936 but its effectiveness in passing salmon, even when new, was limited.

Prime Salmon Nursery Habitat in an Aroostook River Tributary Stream

The first recorded salmon stocking in the Aroostook River occurred in 1895. That year the United States Fish and Wildlife Service (USFWS) released 145,000 salmon fry produced from Penobscot River salmon at the Craig Brook National Fish Hatchery (CBNFH) in Orland, Maine. Thousands of Atlantic salmon fry and parr were stocked sporadically from 1895 through the

1970's by federal and state agencies. Unfortunately the fishway at the Tinker Dam continued to deteriorate and the numbers of adult salmon observed in the Aroostook River remained low.

Local salmon fishing enthusiasts formed the "Atlantic Salmon for Northern Maine, Inc." (ASNM), a non-profit conservation organization, in 1974. The group's stated goal is to assist with restoration of self-sustaining runs of Atlantic salmon in the Aroostook River. One of their first major undertakings was to address the fish passage deficiencies at the Tinker Dam. The Tinker Dam is located on the Aroostook River in Canada near the ME/NB border and Canadian law did not require the dam owner to bear the cost of replacing the fishway. The ASNM proposed to raise and donate $200,000 for the project if the dam owners would install and operate a state of the art fish lift to pass salmon above the dam. An agreement was reach with fisheries agencies on trapping and sorting protocols that would prevent the invasion of non-native species (e.g. pickerel and smallmouth bass) through the fish lift.

The new fish lift was constructed and went into operation thanks to a remarkable effort by ASNM and the local communities. The Atlantic Salmon Commission (ASC) supported the restoration effort by trucking adult salmon, captured in the Penobscot and Union Rivers, to the Aroostook River in 1980 and 1981.

The Canadian Dept. of Fisheries and Ocean (DFO) operates a salmon trapping and hatchery facility at the Mactaquac Dam on the Saint John River just above the head of tide in Fredericton, NB. All salmon ascending the Saint John system, including those destined for the Aroostook River, are captured in the Mactaquac trap. The DFO trucked 34 salmon captured at Mactaquac to the Aroostook River in 1983 and have continued to stock a minimum of 50 adult salmon in the lower Aroostook every year since (except 1990). The ASC assisted the DFO in the 1980's by trucking adult salmon from Mactaquac to upriver releases sites near Ashland.

Ironically salmon abundance began a steady decline for unknown reasons throughout Canada and the US in the years following fish lift construction at the Tinker Dam. The number of adult spawners passing the Tinker fish lift was not adequate to restore salmon populations in the Aroostook, and it became evident that stocking of more juvenile salmon would be required. US and Canadian agencies stocked over 1 million juvenile salmon (fry, parr, and smolts) in the Aroostook from 1978-1991. By the 1990's resources at the existing federal hatcheries were fully committed to combating the salmon decline in other Maine rivers. Salmon populations there were even lower than those in the Saint John watershed. The ASC's operating budget was cut by over 50% following the severe state budget deficits of the early 1990's, eliminating most of it's biological staff and any hope of a new state funded hatchery for the Aroostook River.

In the absence of increased state funding, the ASNM resolved to finance, build, and operate their own private hatchery to provide salmon for the Aroostook River. Construction of the Dug Brook Fish Hatchery (DBFH) began in the fall of 1994 and the first salmon fry (4,000) were reared at DBFH and released in Aroostook River in 1995. Sea-run Saint John salmon captured and spawned by the DFO at Mactaquac produced eggs for the hatchery. Eggs were typically transported to the DBFH in February, incubated until they hatch in May, and immediately released in to the Aroostook River.

Production capacity at the DBFH was quickly expanded to accommodate up to 2 million fry. Returns of wild adult salmon to the Mactaquac fish trap were insufficient to meet this egg

demand and the DFO began a cooperative captive-rearing program with commercial aquaculture operators. Saint John River smolts were place in sea-cages in the Bay of Fundy, reared to adult, and captive spawned in 1996 by the DFO. That spawning produced over a half million eggs for the DBFH. The sea-cage rearing program was unexpectedly terminated the following year when an outbreak of ISA, a virulent salmon disease, forced the depopulation of the broodstock sea-cages. The entire area has been quarantined due to ISA since 1997.

Dug Brook Hatchery

The DFO and ASNM developed an alternative plan to captive-rear broodstock in freshwater at the Mactaquac Biodiversity Facility (MBF). Production of the additional 2 million eggs for the DBFH increases the MBF annual operating expenses by over $50,000 CAD. The DFO could not fund that added expense and the ASNM requested financial assistance from the ASC in 2002. The ASC determined that the ASNM/DFO plan represented the most efficient option available for producing eggs for the hatchery and agreed to fund up to 60% of the program costs for that year. The ASC could not guarantee annual renewals of that funding.

Dedicated DFO scientists continue to manage salmon populations in the Saint John watershed and endeavor to develop and explore new techniques such as adult stocking strategies. Their expertise in management and production of the Aroostook captive-reared broodstock is fundamental to program success. In 2004 DFO biologists advocated for the termination of the trap and truck policy at Mactaquac and implementation of a free-swim strategy. If adopted, all salmon will be released in the lower river and have the opportunity to identify and select their natal tributary. This policy should enhance the opportunity for Aroostook origin salmon to locate and return to their home river.

The ASC regained funding in 2000 for biological staff to oversee Atlantic salmon management activities in northern Maine. The ASC is currently conducting modern GPS habitat surveys of the Aroostook to facilitate planning; providing administrative assistance with egg importation, disease screening, and permitting; facilitating communication between regulatory authorities and Canadian and US scientists; writing and issuing contracts to provide financial support for the ASNM, analyzing current and historic data to develop management prescriptions and stocking recommendations; providing technical assistance to the DBFH during fry distribution, and designing and conducting research to evaluate the relative success of fry produced from sea-run and captive-reared broodstock.

The ASNM continues to make a vital contribution to the Aroostook River Atlantic salmon restoration effort. Their DBFH provides the only salmon currently available for stocking in the Aroostook River, and installation of the fish lift at the Tinker Dam (sponsored by ASNM) has reopened the river to migrating salmon. In recent years the ASNM has undertaken habitat improvement projects to restore the integrity of eroded stream channels in cold-water tributaries. The ASNM also encourages community involvement and resource awareness through involvement in the “salmon in schools” aquarium program and presentations at the education center attached to the hatchery. Salmon abundance remains near record lows in the Aroostook

(and elsewhere) and the dedicated efforts of all restoration partners will be required to restore this resource.

PENOBSCOT RIVER RESTORATION PROJECT

An unprecedented venture to rebalance hydropower production and the ecological importance of a river system took a giant step forward with the announcement of the Penobscot River Restoration project in October 2003. Conservation groups, the Penobscot Indian Nation, Pennsylvania Power and Light Corporation (PPL), the State of Maine (including the Commission) and the U.S. Department of Interior are partners in this landmark project, which endeavors to reconfigure hydropower facilities in the lower Penobscot River thereby opening more than 500 miles of habitat to sea-run fish.

As part of the implementation of the project, the Veazie and Great Works dams will be removed and a fish passage channel will be installed at the Howland Dam. Additionally, upgraded fish passage facilities will be installed at four other hydro projects.

Commission staff participated in several work groups and at different discussion levels while providing input on the many issues surrounding the development of the conceptual agreement. Information was provided on dam removal effects on the Atlantic salmon resource, potential Atlantic salmon habitat gains, reduction of cumulative effects on upstream and downstream migrating salmon, upstream and downstream fish passage at the remaining dams, minimum flow allocations, establishment of mitigation funds, and the development of a fisheries white paper.

The Veazie Dam is the first to be removed as part of the Penobscot Restoration Project.

Multiple dams on the Penobscot River continue to impede the safe upstream and downstream passage of sea-run fish. The Penobscot Restoration Project is the first project that provides an essential ingredient for the successful restoration of Atlantic salmon as well as other species of native sea-run fish in the Penobscot – their ability to reach vast quantities of productive spawning and rearing habitat. To that end, this project will:

- ♣ reestablish the river's historic connection to the ocean, dramatically improving access to over 500 hundred miles of river habitat,
- ♣ allow several species including striped bass, Atlantic and shortnose sturgeon, and rainbow smelt to regain their entire historical habitat,
- ♣ improve access to hundreds of miles of river and dozens of lakes and ponds that historically provided habitat for American shad, alewife, blueback herring, and American eel,
- ♣ significantly improve adult Atlantic salmon's ability to reach vast quantities of productive spawning and rearing habitat in the Penobscot River,
- ♣ allow Atlantic salmon to regain half of their historical habitat in the river with just one dam passage, which will have a new fish lift installed,
- ♣ allow nutrients derived from sea-run fish to reach farther up river, and the natural flushing of sediments will reach Penobscot Bay, restoring a natural cycle to the river,
- ♣ The restoration of sea-run fish to the river will enhance the supply of food sources for a wide variety of fish and wildlife inhabiting the Gulf of Maine,
- ♣ restore the Penobscot Indian Nation's ability to obtain sustenance, cultural, and identity from the river that bears their name,
- ♣ allow PPL, under a reconfigured hydro generating system, the opportunity to maintain 90% of current power production.

Implementing this landmark project will take time. First, a final settlement agreement must be created. A not-for-profit corporation will receive a five-year option period to purchase the Veazie, Great Works, and Howland dams beginning on the date that the Comprehensive Settlement Agreement is signed. Removals and modifications would likely occur between 2006 and 2010 and after all necessary regulatory approvals have been received.

For more information of the Penobscot Project please visit: www.penobscotriver.org.

Streamside Incubation

The Sidney office of the Maine Atlantic Salmon Commissions (MASC) began conducting projects specifically aimed at broadening salmon restoration in 2002. The intent was to investigate alternate incubation techniques for Atlantic salmon in southern central Maine, primarily on rivers where hatchery resources are unavailable or minimal. The method we focused on to obtain this goal was introductions and supplementation of early salmon life stages incubated in streamside incubators.

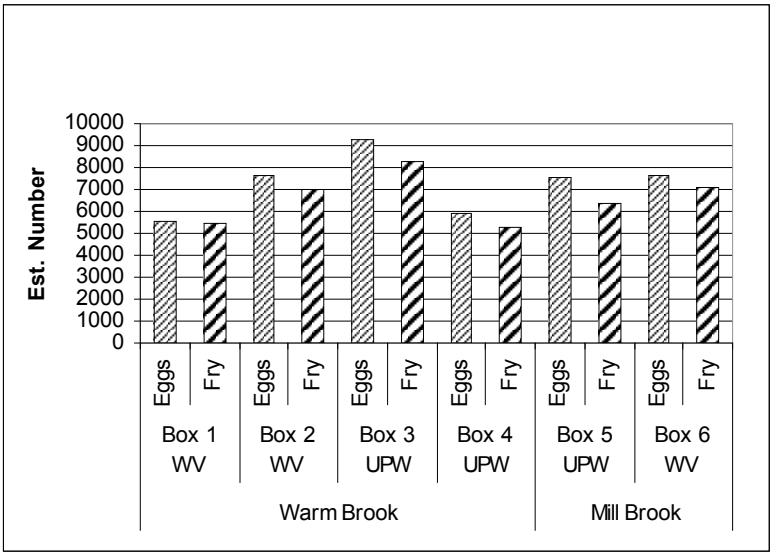
Streamside incubation is a low-tech, low-cost method of incubating eggs. Eggs are moved from the hatchery to incubators set up streamside with gravity fed water as early as possible during the incubation process. The eggs are not handled after installation and incubators are only checked periodically to ensure flowing water. This method of incubation is very attractive for volunteer groups. Non-governmental organizations are able to incubate eggs without large financial investments or much volunteer time. Streamside incubation is currently being used by volunteer organizations on the west coast and in Canada for a variety of salmonid species including Atlantic salmon. A feasibility study was needed to move this type of restoration tool to Maine.

Feasibility of streamside incubation as an alternative incubation method was tested in 2003 for volunteer groups interested in participating in Atlantic salmon restoration. Two types of flow-through incubators were constructed from discarded refrigerators. Three incubators (WV) were designed to hold egg filled Whitlock-Vibert boxes placed within an artificial channel (Figure 1). In addition, three incubators (UPW) were designed to hold eggs between layers of poultry nesting material (Figure 1).

Figure 1. Two types of streamside incubator used in 2003 Left, WV incubator with Whitlock-Vibert boxes lain in an artificial channel and right, UPW incubator with poultry nesting material.

Incubators were deployed at three sites on two tributaries to the Sandy River. In February a total of 43,000 Penobscot origin eyed Atlantic salmon eggs, at approximately 38% development, were divided equally into each of the six incubators. All incubators were checked biweekly during the incubation process to ensure flowing water. At approximately 95% development, fry were enumerated to obtain hatching success and released into the Sandy River. Success ranged from 85% to 98% with an average of 90% for all six incubators (Figure 2).

Figure 2. Number of eggs deposited and resulting fry removed from six streamside incubators of two designs from two locations.



To assess feasibility all purchases were record as well at time spent. Total operational cost for the project was $2,351. Total time spent on this project, not including traveling time, amounted to 1,355 hours. Hatching success, time expended and low cost makes streamside incubation a feasible Atlantic salmon restoration approach for volunteers.

The streamside incubation feasibility project was able to show in the initial year that it can successfully be accomplished with minimal cost and effort. However, the project used incubators that were scaled down in capacity to hold a relatively small number of eggs. The average number of eggs in the streamside incubators was 7,200 eggs per incubator. If streamside incubation were to be used as an alternate incubation strategy for a watershed or large river, a greater numbers of eggs would be needed per incubator. If the entire incubator was used it could potential incubate 100,000 eggs. It would be beneficial to investigate the potential of streamside incubators to incubate greater numbers of eggs.

The capacity of the decommissioned refrigerator as streamside incubators were tested in 2004. Two incubators, used previously, were expanded to utilize the entire chamber. The two incubators were deployed on one of the water sources from the original project. In February, for comparison purposed, we loaded 40,000-eyed eggs into one incubator yielding a low density of 0.55 eggs/cm^2 and 90,000 eyed eggs into the other incubator yielding a high density of 1.25 eggs/cm^2. All eggs were Penobscot origin. Incubators were monitored biweekly to record observation and ensure flowing water. At approximately 95% development, fry were enumerated to obtain hatching success and released into the Sandy River. In the high-density incubator we noted heavy losses of approximately 60% and in the low-density incubator no more than 5% loss was observed. The results indicate safe egg densities may be 0.55 eggs/cm2 for a refrigerator size incubator.

The next phase of streamside incubation testing will be to test the quality of fry from streamside incubators compare to hatchery-incubated fry. In 2005 John Sweka and Meredith Bartron from the U.S Fish and Wildlife Service have proposed to look at juvenile Atlantic salmon survival in the Sheepscot River. The preliminary design is to place genetic groups of Atlantic salmon fry of known parentage throughout the West Branch and mainstem of the Sheepscot River and

genetically sample the cohort over time until they leave the river as smolts. It should be possible to determine differential survival of juveniles across regions of the Sheepscot River. If some fry were incubated streamside and release to the river it is also possible to determine their survival.

The 2005-streamside incubation project is intended to compare performance of hatchery-produced fry with streamside-incubated fry. The experimental design is to release, at approximately equal densities, streamside incubated and hatchery incubated river specific Atlantic salmon fry in the West Branch of the Sheepscot River. Half of the Atlantic salmon fry needed for the West Branch will be incubated streamside near Somerville in two streamside incubators. The releasing of the fry will be coordinated to occur as close to the stocking time of the hatchery fry as possible. Genetic samples will be taken over a two-year period during normal population assessment. John Sweka and Meredith Bartron will analyze all genetic samples. Findings from this study are expected in 2008.

INDIVIDUAL RIVER REPORTS

The following reports highlight activities on specific rivers. Rivers not listed had minimal visits by Commission staff. *It is in **no** way meant to imply that the system has low or no value to wild Maine Atlantic salmon*.

AROOSTOOK RIVER

The Aroostook River is located primarily in Maine, but it is a tributary to the Canadian St. John River system, which enters the Bay of Fundy at the city of Saint John, New Brunswick. Management of Atlantic salmon in the Aroostook River is an international effort between the Canadian Department of Fisheries and Oceans (DFO), Maine Dept. of Inland Fish and Wildlife (MDIFW), New Brunswick Dept. of Natural Resources (NBDNR), the non-profit organization Atlantic Salmon for Northern Maine (ASNM), and the Maine Atlantic Salmon Commission (ASC).

1. Population Monitoring

Adult Trap Operations

Mactaquac Dam. The Canadian DFO operates a fish trapping and sorting facility at the Mactaquac Dam on the St. John River at Fredericton, NB. This is the first dam that fish encounter on their upstream migration and all salmon returning to the Aroostook River to spawn must pass this facility The number of MSW (multi-sea-winter aged) salmon observed was nearly identical to last year (744 vs. 743) and remained well below the 5-year mean trap catch of 1655 fish. Captures of 1SW fish (1423) increased by 11% compared to 2003 (1278), but were also far short of the 5-yr mean (3165).

Tinker Dam. The Tinker Dam is the gateway to the Aroostook River and is located five km upstream from the confluence with the St. John River. PDI Canada, Inc. operates a fish trapping and sorting facility as part of the Tinker Dam Hydro Project under an agreement with ASNM. The Tinker trap catch was 8 salmon (1 MSW and 7 1SW) in 2004. The 5-year mean trap catch at the Tinker dam is 22 salmon (10 1SW and 12MSW).

Electrofishing

A multi-year research program to evaluate fry stocking in the Aroostook River was initiated in 2003. The ASC established study areas on two adjacent tributaries, Munsungan and Mooseluek streams, to compare the performance of fry produced by sea-run broodstock and those produced by captive-reared broodstock. Electrofishing crews succeeded in collecting data at seven of the eight sampling locations despite high water levels. Performance of stocked fry improved in both study streams relative to 2003. Survival of the captive-reared fry stocked in Mooseleuk Stream increased from 0.49 fry/unit in 2003 to 7.57 YOY/unit in 2004 (single pass densities). Sea-run fry stocked in Munsungan Stream improved from 1.29 YOY/unit to 5.46 YOY/unit in 2004. Survival rates are often variable between cohorts, but the improved flows and temperatures observed in 2004 undoubtedly enhanced fry performance.

Stocking

Juvenile Salmon. Atlantic Salmon for Northern Maine. Inc. (ASNM) owns and operates the Dug Brook Hatchery (DBFH) in Sheridan, Maine to produce Atlantic salmon fry for the Aroostook River. The hatchery has traditionally relied exclusively on fertilized (eyed) salmon eggs from sea-run "St. John River strain" salmon captured by the DFO at the Mactaquac Dam fishway trap in Fredericton, NB. The DFO spawn and incubate the eggs at the Mactaquac Biodiversity Facility (MBF) until the "eyed stage" is attained, usually by early February. The eggs are tested in compliance with U.S. Title 50 fish health criteria and then imported by the ASNM to Dug Brook Hatchery to complete incubation and hatching. The ASNM stocks the non-feeding fry soon after hatching into the Aroostook River in accordance with ASC recommendations and permit requirements.

The production goal for the DBFH is 2 million fry annually, but the annual egg production available for the Aroostook program has averaged less than 10% of that (137,000 eggs) in recent years (Table 1.). Broodstock availability has been curtailed by elimination of the sea-cage broodstock program due to ISA infection in 1997, positive tests for IPN disease in broodstock in 2000, and a concurrent decline in sea-run salmon returns to the St. John River.

Table 1. ASNM Dug Brook Hatchery Egg Importation History.

Year	Num.Eggs	Broodstock Origin
1996	500,000	St. John strain: sea-run adults returning to dam
1997	605,000	St. John strain: captive-reared in sea cages from MBF smolts.
1998	139,000	St. John strain: sea-run adults only (ISA eliminates sea-cage program).
1999	166,000	St. John strain: sea-run adults returning to dam
2000	0	Broodstock tested positive for IPN, no eggs imported.
2001	145,000	St. John strain: sea-run adults returning to dam
2002	126,000	St. John strain: sea-run adults returning to dam
2003 sea-run	115,000	St. John strain: sea-run adults returning to dam
2003 captive	131,000	St. John strain: captive-reared at hatchery from MBF smolts
2003 total	**246,000**	St. John strain, captive and sea-run combined total.
2004 sea-run	135,000	St. John strain: sea-run adults returning to dam
2004 captive	339,000	St. John strain: captive-reared at hatchery from MBF smolts
2004 total	**474,000**	St. John strain, captive and sea-run combined total.
5-yr Avg.	**137,000**	

In order to compensate for the lack of sea-run broodstock and increase production at the DBFH, the ASNM developed a program with the DFO and the ASC to captive-rear broodstock at the MBF. The first eggs from the new captive-reared broodstock program were available in 2003 and egg production nearly doubled in 2004 due to increased contributions from the captive-reared broodstock program (Table 1.). A complex series of events lead to unexpectedly high fry mortalities during preparation for stocking in May 2004. The mechanism responsible for the mortalities was a combination of time-sensitive biological and procedural factors that were subsequently identified and rectified. An estimated 58,000 sea-run fry and 110,000 captive-

reared fry survived and were stocked at multiple locations. Results from the research on Munsungan and Mooseleuk Streams suggest that fry stocked in 2004 performed very well.

Adult Salmon. DFO trucked 50 sea-run grilse captured at the Mactaquac fish trap to the Aroostook River and released them in the Tinker Dam headpond near the Maine-New Brunswick border per standing agreement with ASNM. Salmon will not be trucked to the Aroostook or Tobique tributaries in future years if the Saint John Basin Board ratifies the "Free-Swim" management strategy proposed in 2004. All salmon will instead be released in the mainstem of the Saint John River and allowed to migrate to their destination of choice. The ASC and ASNM are proponents of this free-swim concept.

Broodstock Management

The strategy developed in 2000 to individually test all broodstock at Mactaquac for disease, and incubate eggs from each spawning in isolated lots has been adopted as the standard operating practice. This procedure permits the segregation of healthy eggs from potentially diseased eggs, and increases the likelihood that eggs will be available for importation to the Aroostook program. Spawning fluid samples collected at Mactaquac for disease testing by the Maine IFW Fish Health Laboratory were imported and transported by ASC staff in 2003 and again in 2004 to prevent delays clearing customs that might jeopardize the integrity of the samples. ASC coordinated the importation and statutory requirements with the US Customs Service and with several USFWS law enforcement and biological divisions.

The number of sea-run broodstock allocated for Aroostook egg production in 2004 was 12 pair of MSW fish. They were spawned in November 2004 at the MBF producing an estimated 90,000 green eggs. An additional 99 captive-reared broodstock were spawned in the fall of 2004, producing an estimated 513,000 green eggs for the DBFH in 2005. The DFO and MIFW are currently conducting the required disease testing of all broodstock spawned in 2004.

3. Habitat

Habitat Surveys

Biologists completed a detailed habitat survey encompassing 60 km of the Big Machias River, an important tributary that joins the Aroostook in Ashland. Historically this tributary is thought to be a major contributor to salmon production in the Aroostook watershed. Habitat data from the survey are currently being analyzed and will be used to develop production estimates and management strategies for Atlantic salmon enhancement.

Water Quality

Temperature data loggers were deployed at one site in Mooseleuk Stream and one site in Munsungan Stream to monitor water temperature in the fry stocking research area. The data logger placed in Mooseleuk stream was lost or stolen but the logger from Munsungan stream provided good data for the May-November deployment period. Preliminary analysis of those data indicates temperatures were favorable for salmon growth and survival during 2004.

4. Fish Passage

Monitoring Fishways.

The Tinker Dam and Caribou Dam fishway passage facilities operated by PDI Canada, Inc.

Fish Passage Consultation and Review
The USFWS in consultation with the ASC is exploring options to obtain federal grants that may be applicable to repairs at the fishway at a dam on the Little Madawaska River. The impoundment created by the dam serves as the primary water source for the Loring property and is considered vital to the long-term development goals of the LDA. Transfer of dam ownership from the U.S. Air Force to the LDA was finalized in 2000.
No progress was made in this endeavor in 2004.

5. Public Meetings and Outreach

ASC staff attended Aroostook River meetings with the Atlantic Salmon for Northern Maine organization and with the international St. John River Advisory Committee in St. John, New Brunswick.

COVE BROOK

Cove Brook is located on the northern edge of Waldo County; one of its small tributaries, Baker Brook, originates in southern Penobscot County. It is the smallest river with a listed salmon population in Maine. Cove Brook is a small tributary to the Penobscot River estuary located approximately 13 miles below the Veazie Dam (head of tide). Cove Brook flows approximately 16.5 km from its headwaters and drains a watershed of only 9.5 square miles in Winterport and Hampden. The National Marine Fisheries Service (NMFS) and the U. S. Fish and Wildlife Service (USFWS) listed the Atlantic salmon population in Cove Brook as endangered on November 13, 2000. ASC staff conducted the following enhancement and management activities on Cove Brook in calendar year 2004. We also include in this report a detailed temperature profile of the mainstem of Cove Brook.

Cove Brook below the Back Winterport Road (Photo by Donna Gilbert, CBWC)

1. Population Monitoring

Electrofishing

Juvenile salmon populations were surveyed by electrofishing at five sites on Cove Brook. The Pipeline, Back Winterport Road index sites, and the Gravel Pit index site recently established as a third index site, as well as two other sites were sampled this year. All sites are located in the Town of Winterport and were sampled at the beginning of August. There were no young-of-year (YOY) salmon or parr found at any of the surveyed sites in 2004. This is the fourth year of not finding juvenile salmon in Cove Brook.

As part of an on going contaminant study being conducted by the USFWS, Cove Brook was sampled this year. The requirements for this study were to collect five white suckers from five different locations within the watershed while sampling salmon habitat. Sucker tissue was analyzed for a suite of contaminants, including 19 inorganic and 22 organ chloride compounds such as DDE, PCB, chlordane, mercury, chromium, and cadmium. Preliminary analysis indicates that these elements did not occur at a concentration above normal background levels.

Unfortunately, we were unable to meet the goal of 25 suckers due the requirement of capturing suckers larger than 30 mm. Cove Brook is a small stream, and larger white suckers just did not inhabit the sampled areas. Blood samples were taken but only one ml of the five ml sample required was collected due to the small size of the captured fish. The blood analysis and somatic measurements from the suckers looked at these key elements: 17B estradiol, 11-ketotestosterone, vitellogenin, and LSI. Supplies and procedures were supplied by the USGS' Columbia Environmental Research Center.

Redd Counts

There were three attempts to find redds in Cove Brook in 2004 (November 1, 9, and 23). There was no spawning activity found in Cove Brook during this time. An extended period of low flows throughout the summer and early fall most likely limited access for adult salmon to upriver spawning grounds.

Since we did not find any juvenile Atlantic salmon over the summer of 2004, we took a closer look at the previous year's redd counts. We now feel that the redds seen in 2003 and counted as Atlantic salmon redds were probably completed by many large brook trout superimposing redds on top of each other. In 2004, we observed many large brook trout digging in the same area at nearly the same time as in 2003 indicating that the 2003 counts were most likely inaccurate.

2. Habitat

Property Purchases or Conservation Easements

The Cove Brook Watershed Council, incorporated January 2001, meets monthly and is made up of a small group of energetic people. The watershed council's goals for the year 2004 were to complete the management plan (started in 2003) and to include in a property sales

agreement, an easement from the landowner on land adjacent to Atlantic salmon spawning habitat.

Obstruction Surveys and Removal

Three obstruction surveys were conducted on Cove Brook during the fall of 2004 to identify Atlantic salmon passage problems. Five beaver dams were removed on the first trip down through the river on October 26. One beaver dam, above the mouth of Baker Brook, turned out to be a significant problem as the dam was continually rebuilt after repeatedly being breached. However, the narrow window for salmon migration was most likely missed before the problem could be addressed. The local Animal Damage Control officer is addressing the problem through traditional trapping measures over the winter months.

Water Quality

ASC recorded summer water temperature on Cove Brook at three sites: Gravel Pit (River Kilometer 4.62), Back Winterport Road (3.56), and Pipeline (0.96).

			No. Days Temperature		
Site	River km	No. Days Sampled	$\leq 22.4^{o}C$	$\geq 22.5^{o}C$	$\geq 27.0^{o}C$
Gravel Pit	4.62	89	88	1	0
Back Winterport Rd.	3.56	89	88	1	0
Pipeline	0.96	89	88	1	0

Water temperatures in Cove Brook do not appear to be a limiting factor for salmon survival, even during low flow instances. As noted above, out of 89 days between June 1 and August 31, only once was temperature recorded in the range of 22.5-26.9^{o}C. This temperature occurred only for a short period of time and salmon could easily have sought refuge during this time. Temperatures do not typically reach critical levels, greater than 27^{o}C, for salmon due to the small character, canopy, and geology of the stream. For the months of June, July, and August, the minimum temperature for Cove Brook occurred in June (7.87^{o}C), whereas the maximum temperature of 24.52^{o}C occurred in August.

Water temperature was also recorded over a three-month period during the winter of 2003-2004 adjacent to the uppermost redd recorded in 2003. Temperature was recorded at 15-minute intervals in an effort to predict if there was an earlier hatch time for Cove Brook salmonids. We looked at this area above the uppermost redd because warmer water temperatures from a significant spring could possibly accelerate egg incubation.

Incubation and hatching temperatures from the Cove Brook site were compared to those collected as part of the Salmon Egg Incubation Project located on a tributary to the Sandy River in Avon, Maine. The daily temperatures from Cove Brook during this time period, mid-April did not differ significantly from the recorded temperatures from the tributary in Avon. Average monthly temperature for January was 0.48^{o}C; February 1.03^{o}C; March 0.96^{o}C, and April 5.01 ^{o}C. Temperatures began to rise as the length of days increased. No YOY were found in 2004 in Cove Brook so length/weight frequencies could not be compared. All temperature data will be analyzed during the winter and spring of 2004 – 2005 and will be available in late spring by contacting the ASC.

ASC also collected three water quality samples (April 6, July 27, and Oct. 26) in cooperation with the Downeast watershed councils, MDEP, and the George Mitchell Center for Environmental & Watershed Research. The samples were taken during spring run-off, summer low flows, and a fall rain occurrence. Water quality parameters collected during sampling consisted of closed cell pH, air equilibrated pH, acid neutralizing capacity, apparent color, and specific conductivity. Closed cell pH is the preferred pH measurement method since this methodology measures the ambient pH, that is, conditions the fish are living in. The maximum and minimum values for closed cell pH for the spring sampling period were 7.18 and 6.79; for the summer sampling period, 8.13 and 7.66; and for the fall sampling period, 7.92 and 7.53. All samples were analyzed at the George Mitchell Center for Environmental & Watershed Research at the University of Maine.

3. Meetings

ASC Biologists attended monthly Cove Brook Watershed Council meetings.

DENNYS RIVER

The Dennys River is located in eastern Washington County. Beginning at Meddybemps Lake, it flows approximately 32 km to Cobscook Bay in the Town of Dennysville. Cathance Stream is the only major tributary. The Atlantic salmon population was listed as endangered by the National Oceanic and Atmospheric Administration Marine Fisheries Service (NOAA-Fisheries) and the U. S. Fish and Wildlife Service (USFWS) on November 13, 2000. The Atlantic Salmon Commission (ASC) conducted the following enhancement and management activities during calendar year 2004.

1. Population Monitoring

Adult Weir Operations

A weir, located at the head of tide in Dennysville, was operated from 25 May through 12 November, 2004 to trap upstream migrating salmon for the purposes of enumerating the wild run, collecting biological data, and to intercept escaped aquaculture fish. We captured one two-sea winter salmon that was stocked as an age 0+ fall parr. It was released upstream after measuring length, and taking scale and tissue samples. Capturing one fish this year was exceedingly low given the fact that approximately 50,000 smolts from Green Lake National Fish Hatchery are stocked each year in the Dennys River. The trapping operation started slightly later than usual because of damage to the weir caused by unusually high flows associated with heavy rain events in 2003.

Electrofishing

We electrofished 25 sites in the Dennys River drainage, collecting population estimate and biological data for juvenile salmon. The data collection efforts were structured around a Basin-wide Geographical Population Estimate (BGEST) sampling design, where the drainage was

divided into environmentally similar strata and electrofishing sites were randomly chosen within these strata. This approach allows us to estimate the size of the juvenile population in the river and better evaluate the effects of environmental factors and management approaches on the juvenile salmon population. The median parr density for the drainage was 1.8 parr per 100 m^2, with a minimum of zero and a maximum of 6.4 parr per100 m^2. This is the lowest median and maximum parr density over the last four years. The median young of the year (YOY) density was 3.9 YOY per 100 m^2, with a minimum of zero and a maximum of 17.3 YOY per100 m^2. This is the highest maximum and median YOY densities over the last four years.

Telemetry

We assisted NOAA-Fisheries by scanning with a VR-60 ultrasonic telemetry receiver for smolts tagged with ultrasonic pingers when we tended the smolt trap. We did not detect any pingers. This was to aid in interpreting data recorded by automated telemetry receivers.

Redd Counts

We counted 51 redds in the Dennys River ranging throughout much of the spawning habitat in the mainstem. Although we had only one adult salmon return this year, we also stocked 101 adult broodstock salmon from Craig Brook National Fish Hatchery in the vicinity of the Dennys River Sportsman's Club, in the lower river. A portion of these fish were expected to be sexually mature and possibly spawn in the river. Redds observed in the Dennys may almost entirely be attributed to the stocked fish. However, we cannot entirely rule out escapement past the weir that we were unaware of. We counted 38 redds within 3 to 4 kilometers of the stocking location. Some movement farther upstream occurred as well, with 13 redds observed in the middle reaches of the river (Stoddard Rips). This number of redds exceeded our expectations for these fish and may indicate that more were sexually mature than predicted.

We will attempt to evaluate the reproductive success of these fish by trapping some redds for emergent fry, as well as electrofishing later in the year.

Smolt Trapping

We operate a rotary screw smolt trap (RST) in the lower Dennys River each spring to collect biological data and samples from emigrating wild and hatchery stocked smolts. ASC staff tended the trap every day from 12 April to 26 May. We captured 1056 smolts in the RST. Of these, 874 were from smolt stocking, 83 were of wild origin, 25 were from fall parr stocked in 2002, and 75 were from fall parr stocked in 2003. Hatchery smolt capture rates in the RST ranged from 0.9 % to 2.2 %. Capture of smolts released at Meddybemps (headwaters of the river) and smolts released at Robinson's Camps (lower river) differed significantly from expected capture rates (Chi Square test for expected frequencies, $p < 0.001$). This suggest that either Meddybemps fish enjoyed a higher than expected survival rate to the RST, while Robinson's released smolts underachieved, or more likely, the trapping rates for these animals differed due to their different migration distance and environmental conditions. We also sampled both hatchery and wild fish for physiological samples to evaluate their readiness to tolerate seawater. Inability of smolts to tolerate seawater is one of the major problems we are investigating.

2. Population Enhancement

Stocking

We stocked several life-history stages of salmon into the Dennys River, including 216,000 fry, 44,000 fall parr, and 56,000 smolts into appropriate habitat through the drainage. This compares to 133,000 fry, 30,000 fall parr and 55,000 smolts in 2003.
As noted in the redd counts discussion above, we also stocked 101 adult broodstock near the Dennys River Sportsman's Club, of which a portion were expected to be sexually mature and possibly spawn in the river.

Broodstock Collection

We collected 151 parr via electrofishing for transfer to the captive broodstock program at Craig Brook.

3. Habitat

Habitat Enhancement

Using the Dennys River Instream Flow Incremental Methodology (IFIM) data and a revised rule curve for Meddybemps Lake, we adjust water releases at Meddybemps dam to optimize salmon habitat as well as store the maximum amount of water in the lake given flow requirements for the river and current lake levels (Figure 1). Our target flow is approximately 80 CFS at the USGS Dennys River gauge, but somewhat lower flows do not severely decrease the amount of salmon habitat. We maintained this flow rate through much of the summer, but periodically fell below this level (Figure 2). We are currently ahead of schedule this year for lake level moving into early winter. Shallow snow pack and minimal spring rains prevented achieving a "full" lake by June; therefore, we remained below the rule curve until September. Although the lake was behind the rule curve, we were able to keep the lake from dropping severely in the summer, largely due to two heavy rainstorms in August. Maintaining water in the lake during summer is important because it allows us to augment river flows in particularly dry summers. If the lake gets too low, we may be unable to release additional water. Meddybemps Lake levels depend greatly on the timing and amount of spring runoff and rain throughout the summer because the lake has limited water storage capacity and inflow.

Figure 1: Graph of Meddybemps Lake Draw down levels for 2004.

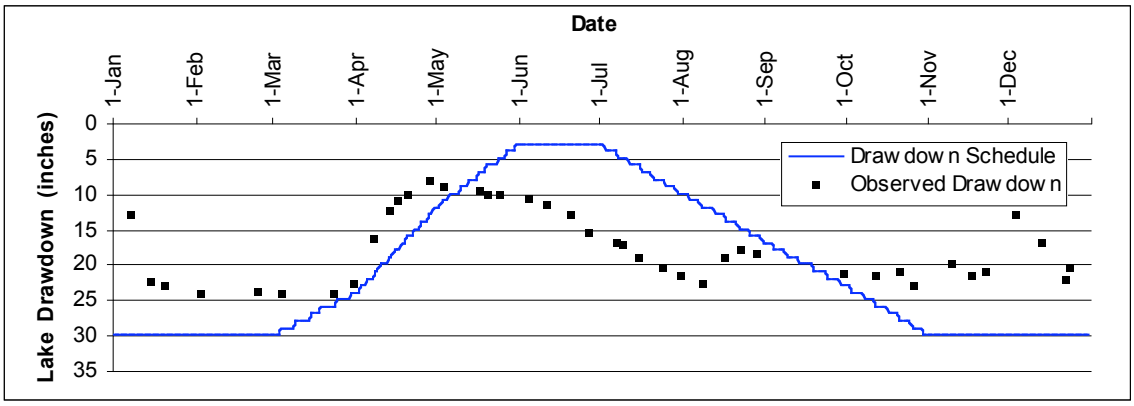
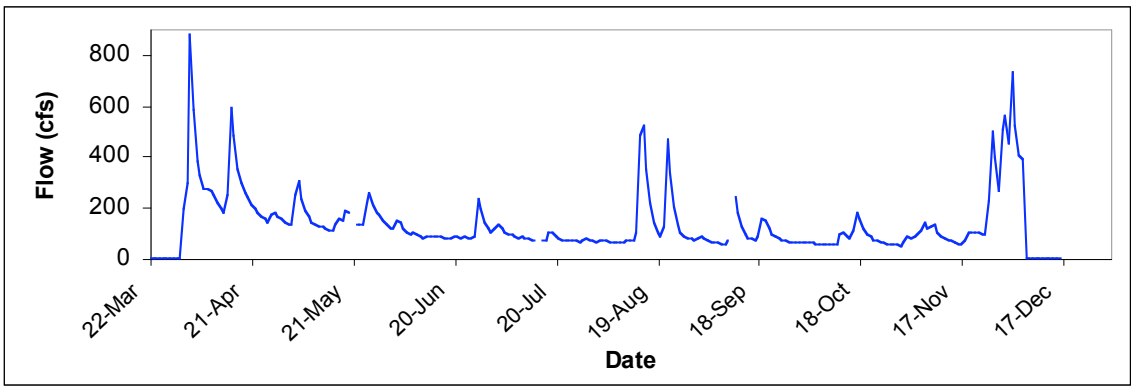


Figure 2: Graph of Dennys River Flows: 2004 (Flow data from USGS)



Property Purchases, Conservation Easements, Habitat Preservation and Protection

Obstruction Surveys and Removal

We documented obstructions to fish passage while conducting redd counts in the fall. We did not record any fish passage problems on the mainstem or lower Cathance Stream. We did not perform any obstruction removal in 2004. ASC continued cooperating with, and monitoring, a study on the effects of beaver dams and beaver dam removal on Venture Brook, a tributary of the Dennys River that historically contained salmon habitat. Dr. Alan Lewis and Dr. Sherrie Sprangers at the University of Maine, Machias, are conducting this multi-year study.

Habitat Surveys

Habitat surveys on the Dennys River are complete and no new major surveys were conducted in 2004. A minimal evaluation of habitat in the minor tributary, Jones Brook, was conducted incidental to a siltation event caused by improper forestry practices. Revised habitat data are scheduled to be available in GIS in 2005.

Water Quality

Water temperature data were collected at 12 sites in the Dennys drainage: 9 on the mainstem and 3 on Cathance Stream. A temperature logger and its data at the weir site were lost due to vandalism.

We deployed and retrieved benthic macro invertebrate rock baskets according Maine Department of Environmental Protection standards in three sites in the Dennys River. These will provide baseline data on the benthic macro invertebrate community in the Dennys River.

The ASC assisted the Maine Department of Conservation (DOC) Forestry Service in an investigation of a logging related siltation event in Jones Brook. Jones brook is a minor tributary of the Dennys River.

4. Public Meetings and Outreach

The ASC staff attended meetings of or engaged in activities with the Dennys River Watershed Council, Dennys River Sportsmen Club, Downeast Rivers Coalition, Downeast Salmon Federation, and Project SHARE. All of these organizations work on salmon habitat and riparian habitat issues in the Dennys River watershed. The president of the Meddybemps Lake Association was briefed on lake levels and water management by email.

DUCKTRAP RIVER

The Ducktrap River is located in Waldo County. It flows approximately 17 km from its source at Tilden Pond to its confluence with the lower Penobscot River estuary at Ducktrap Harbor in Lincolnville. Kendall Brook, Tucker Brook, and Black Brook are the only major tributaries. The National Marine Fisheries Service (NMFS) and the U.S. Fish and Wildlife Service (USFWS) listed the Atlantic salmon population in the Ducktrap River as endangered on November 13, 2000. ASC conducted the following enhancement and management activities on the Ducktrap during calendar year 2004.

Ducktrap River Photo by: ASC Staff

1. Population Monitoring

Electrofishing

Six sites on the Ducktrap River, including two index sites, were sampled during early August, Young-of-year (YOY) salmon were found at four of the six sites. One-run densities ranged from 2.93 to 17.00 fish per unit, where one unit equals 100 square meters (Table 1). Biological data (length, weight) was collected from YOY sampled at each site. No parr were found during sampling in 2004. Over the previous three years, we had not found any YOY in the Ducktrap; however, parr had been found in low numbers.

Table 1. Atlantic salmon Young-of-Year Densities, Ducktrap River, 2004.

Site	Units (100 sq. m)	Total Catch	Lower 95% C.I.	Estimate	Upper 95% C.I.	One-Run Density
Rte. 52 site A	1.82	15	-	-	-	8.24
Below site B	1.92	24	32	121	210	5.73
Below site C	5.47	16	16	64	141	1.46
Black Bk.	4.55	28	27	36	64	1.48
Below Kendal Bk.	8.63	12	-	-	-	1.47

As part of an on going contaminant study being conducted by the USFWS, the Ducktrap River was sampled this year. The requirements for this study were to collect five white suckers at five locations throughout sampled salmon habitat. Sucker tissue was analyzed for a suite of contaminants, including 19 inorganic and 22 organochloride compounds such as DDE, PCB, chlorodine, mercury, chromium, and cadmium. Preliminary analysis indicates that these elements did not occur at a concentration above normal background levels.

Unfortunately, we were unable to meet the goal of collecting 25 suckers due to the requirement of capturing suckers larger than 30 mm. Blood samples were also to be from the five different locations. Blood was drawn but the five ml requirement could not be reached due to the small size of the fish. The blood analysis and somatic measurements from the suckers looked at these key elements: 17B estradiol, 11-ketotestosterone, vitellogenin, and LSI. Supplies and procedures were supplied by the USGS' Columbia Environmental Research Center.

Redd Counts

There was one attempt to document spawning in the Ducktrap River in the fall of 2004 (November 22). In addition, on October 28, the area between Kendall Brook and Rte. 52 was surveyed for beaver activity and early signs of spawning was noted in the Kendall Brook area. On November 22, nine redds and five test digs were observed, primarily in the Kendall Brook area. However, no spawning salmon were actually observed. Summer flows in the Ducktrap averaged nearly 10 cfs (cubic feet per second) during 2004, compared to an average flow of one cfs or less during the summer of 2003. Good flow conditions most likely provided a much more desirable passageway to upriver spawning areas.

2. Habitat

Property Purchases or Conservation Easements

The Coastal Mountains Land Trust (CMLT) and Ducktrap Coalition completed two riparian land protection projects during 2004. A total of 83% of the land along the river and 48% of the lands along Tucker Brook, Black Brook, and Kendall Brook are now conserved, either through conservation easements or acquisition of full title. Discussions continue with several other landowners, and CMLT anticipates some of these projects will be completed in 2005 or 2006.

Obstruction Surveys and Removal

Obstructions on the Ducktrap were not a significant problem this year. One survey of the river was taken on October 28 and one beaver dam was breached in the upper watershed near Tucker Brook.

Water Quality

ASC staff recorded summer water temperature on the Ducktrap River at two sites: below the Rt. 52 and Dickey Mill Road bridges.

			No. Days Temperature		
Site	River km	No. Days Sampled	$\leq 22.4^{o}C$	$\geq 22.5^{o}C$	$\geq 27.0^{o}C$
Dickey Mill Road	14.35	89	30	58	1
Rte. 52	8.02	89	86	3	1

In 2004, the Ducktrap River experienced elevated temperatures. As noted above, out of 89 days that temperature was measured from June 1 to August 31, temperatures in the range of ≤ 22.5-26.9^{o}C occurred on 58 days, whereas a temperature above 27^{o}C occurred just once. It was noted that these temperatures typically occurred during the later part of the afternoon into early evening (2:00 p.m. to 7:00 p.m.) and usually rebounded quickly with the onset of nightfall. During periods of elevated temperatures salmon have the ability to move and seek refugia. For the months of June, July, and August, the minimum temperature for the Ducktrap occurred in June (11^{o}C) whereas the maximum temperature of 27.69^{o}C occurred in August. Additional temperature data will be analyzed during the winter and spring of 2004 – 2005 and will be available in late spring by contacting the ASC.

In addition to the summer collection of water temperature data, the ASC also collected temperature data at one location throughout the winter of 2004. Monthly average temperature for January was 0.09^{o}C; February, -0.06^{o}C; March, 0.26^{o}C; and April, 5.60^{o}C. It was noted that temperatures began to rise as the length of days increased.

ASC also collected two water quality samples (July 27, and Oct. 26) in cooperation with the Downeast watershed councils, MDEP, and George Mitchell Center for Environmental & Watershed Research. The samples were taken during summer low flows, and a fall rain occurrence. Water quality parameters collected during sampling consisted of closed cell pH, air equilibrated pH, acid neutralizing capacity, apparent color, and specific conductivity. Closed cell pH is the preferred pH measurement method since this methodology measures the ambient pH, that is, conditions the fish are living in. All samples were analyzed at the George Mitchell Center for Environmental & Watershed Research at the University of Maine. This data will be used to create a catalog of water quality data for future reference. The MDEP also collected water quality data from the Ducktrap. Water quality data is also available upon request.

3. Meetings

The ASC staff attended several meetings of the Ducktrap Coalition.

EAST MACHIAS RIVER

The East Machias River is located in Washington County. Originating at Pocomoonshine Lake, it flows approximately 59 km to Machias Bay in the town of East Machias. Beaverdam Stream, Northern Stream, Seavey Stream and Chase Mill Stream are significant tributaries in the drainage. The Atlantic salmon population was listed as endangered by the National Oceanic and Atmospheric Administration Marine Fisheries Service (NOAA-Fisheries) and the U. S. Fish and Wildlife Service (USFWS) on November 13, 2000. The Atlantic Salmon Commission (ASC), in an effort to restore the salmon, conducted the following enhancement and management activities in calendar year 2004.

1. Population Monitoring

Adult Weir Operations

Electrofishing

We electrofished 9 sites in the East Machias River drainage, using multiple-pass depletions to generate population estimates for juvenile salmon. Median density of parr was 3.2 parr per 100 m^2, with a minimum of zero and a maximum of 8.6 parr per 100 m^2. These are the lowest median and maximum parr densities in the last four years. Median density of young-of-the-year (YOY) was 16.7 YOY per 100 m^2, with a minimum of zero and a maximum of 117.5 YOY per 100 m^2. This is the highest median YOY density over the last three years, and is the highest maximum YOY density in five years.

Telemetry

No active or passive telemetry was undertaken during 2004.

Redd Counts

We conducted redd surveys in fall 2004 on the East Machias River. We counted 10 redds in the watershed. We also checked for redds from the previous year during spring fry stocking. In 2003, extremely high water prevented us from being able to survey many areas for redds effectively. However, we did not document any additional redds from 2003.

2. Population Enhancement

Stocking

We stocked approximately 316,000 fry into appropriate habitat throughout the drainage in May. In 2003 we stocked 314,000 fry. No smolts or adults targeted for natural spawning were stocked in the East Machias River this year.

Broodstock Collection

We collected 158 parr for use as captive broodstock. These fish were transported to Craig Brook National Fish Hatchery.

3. Habitat

Habitat Surveys

No new habitat surveys were conducted within the East Machias watershed.

Gravel Permeability

Permeability is a means of quantifying the quality of salmon spawning habitat by measuring the flow of water moving through the substrate. We tested the streambed permeability in a known spawning area of Chase Mill Stream in the East Machias drainage, revisiting sampling done in 1987. Permeability is important because all else being equal, incubating eggs and alevins survive at a higher rate with increasing oxygen supply, removal of metabolic wastes, and interstitial spaces that are positively related to intragravel flow. Replicated testing was done using a Terhune Standpipe device at multiple locations in juvenile rearing or spawning areas. By repeating the work done in 1987, we will be able to compare the permeability of the area and see if the permeability has changed over the past 17 years. We plan to continue this work in 2005.

Habitat Enhancement

We did not conduct habitat enhancement in the East Machias drainage in 2004.

Obstruction Surveys and Removal

We documented obstructions to fish passage during other fieldwork. We did not record any fish passage problems on the mainstem, but we breached two beaver dams on Northern Stream prior to spawning season.

Water Quality

Water temperature data were collected at 9 sites in the East Machias Drainage, 4 on the East Machias River, and 5 on important tributaries.

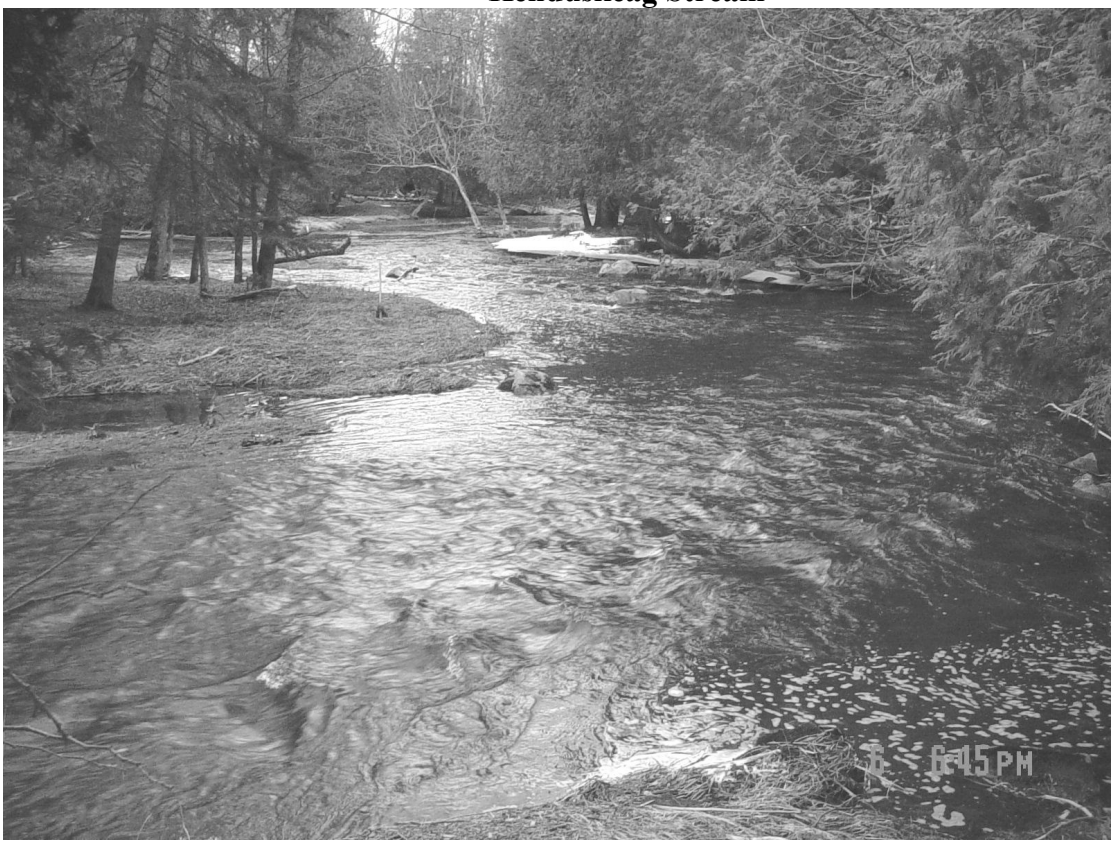
4. Public Meetings and Outreach

ASC staff attended meetings of or engaged in activities with the East Machias River Watershed Council, Downeast Rivers Coalition, Downeast Salmon Federation and Project SHARE. All of these organizations work on salmon habitat and riparian habitat issues in the East Machias River watershed.

KENDUSKEAG STREAM

Kenduskeag Stream drains an area of 214 square miles west of Bangor and is the largest lower Penobscot River tributary. Salmon have been found in many of the cooler tributaries above Kenduskeag Village in previous years. These tributaries include French Stream, Black Stream, Pierre Paul Brook, Allen Stream, and Crooked Brook. The ASC conducted the following enhancement and management activities in calendar year 2004.

Kenduskeag Stream



Site Number "7" Restoration area **Photo by: Peter Ruksznis, ASC**

1. Population Monitoring

Electrofishing

We are into our second year of an experiment where we are comparing the salmon population between a restored habitat reach and a disturbed habitat reach. We electro-fished in the fall of 2003, spring 2004, and summer of 2004 as a follow-up to the fall 2003 parr stocking to see how many fish over-wintered and remained in the two reaches.

We began the project of the degraded area of the river by conducting an extensive biomass survey in 2003. The biomass survey consisted of sixteen 200-foot sections, eight in a control section and eight in the restored area. Out of the 16 sections, eight were electro-fished with each section separated by blocking seines to eliminate fish movement between sections. In each section, all fish species caught were counted with 30-90 fish of each species weighed and

measured. We then stocked 1,300 fall parr from Green Lake National Fish Hatchery. Parr were divided equally, marked with a fin-clip, and spread throughout the 16 sections. The control section fish had a left-ventral fin-clip (LV) mark and the restored area parr had a right-ventral fin-clip (RV) mark.

During the fall of 2003, the fish were given a week to acclimate to their new environment. Fall rains made it difficult to effectively sample all areas in detail so we quickly performed one-run density estimates to capture as many salmon as possible while covering as many sections as could be done in a day. Although we stocked nearly 80 fish in each section, between 25-30 fish were caught in each section. Also two wild parr from the previous year (2001) were caught; each having an upper-caudal (UC) mark showing we had sampled these fish the previous year. This was the beginning of a three-year project to see how effective a restored habitat reach can be in rearing parr.

We have completed biomass estimates for 2003 for seven sites for the following species: Atlantic salmon, Blacknose dace, Creek Chub, Common Shiner, Golden Shiner, White Sucker, Crayfish, Three Spine Stickleback, Pumpkinseed Sunfish, Red Breasted Sunfish, Tadpole, Brook Trout. Below is a portion of the biomass results.

Blacknose dace consisted of the highest densities, 115.4 dace/unit or 72.8% of all fish in the research area. Estimated populations of dace ranged from 333 to 874 fish per site (median: 499) with an average weight of 11.23 g/fish. Mass ranged from 3.7 kilograms (kg) to 9.8 kg per site (mean: 5.6 kg). All areas were measured in square meter units (m^2) and converted to hectares. Therefore, for the combined sampled sites (0.324 ha), blacknose dace weighed 41.3 kg for a biomass of 127.5 kg*/ha^{-1}.

White Suckers comprised one of the smallest groups in abundance (3.6%) of all fish species sampled with an average density of 6.06 fish/unit. Estimated populations ranged from 15-40 fish per site (median of 25) with an average weight of 9.1 g/fish. Mass ranged from 0.096 kg to 0.26 kg per site (mean: 0.16kg).

Brook trout provide3 the most popular sport fishery in the watershed but represented the least abundant fish species in the study area (1.1 %) an average density of 1.91 fish/unit. Estimated populations ranged from 2 - 25 fish per site (median: 11) at an average weight of 19.3 g/fish. Mass ranged from 0.04 to 0.48 kg per site.

Fall Parr (age 0+) is the primary life stage being monitored during this project. For comparison, 1,314 (37 lbs or 35.5 fish/lb) fall parr from GLNFH were stocked throughout the 16 sites in October of 2003. At stocking, 121 fish were weighed and measured averaging 106.3 mm in length and 13.5 g in weight (39.1lb = 1395 parr est.).
Based on numbers of parr stocked per site, mass ranged from 0.85 to 1.39 kg per site. The area is larger for this estimate since we are using all 16 sites, 77.79 units or 0.7779 ha. Thus the biomass is (17.73 Kg / .7779 ha) 22.8 Kg* ha^{-1} at an average density of 17.14 fish / unit.

Post stocked fall parr were sampled for biomass and estimated two weeks following the initial stocking. One hundred fifty fish were caught in 13 sites after the initial stocking of 1314 parr, 3 sites had a sample of 0 fish. Post stocked parr were 3% of the total catch. Estimates ranged from 0-44 (median 29) fish. The average weight of 13.5 grams was used again for this calculation

since the fish were not handled a second time in just 2 weeks. Mass ranged from 0.189 to 0.486 Kg per site. The area was again .7779 ha (77.79 units), thus the biomass is (4.77 Kg / .7779 ha) 6.13 $Kg*ha^{1}$ at an average density of 4.6 fish / unit.

Table 1. Biomass Densities, Kenduskeag Stream, 2003.

Species	Est. Range	Median	Ave Wt. Gr.	Mass Kg.	Ave. Ha	Kg / ha Biomass 1	$Kg*ha^{-1}$ fish/unit Biomass 2	Fish/unit Density
BND	333-874	449	11.23	3.7 – 8.9	0.3239	41.3 / .3239	127.5	115.38
WHS	15-40	25	9.1	.096 - .26	0.3239	1.196 / .3239	3.69	6.05
BKT	2-25	11	19.3	.04 - .48	0.3239	1.06 / .3239	3.27	1.91
AST1	1314*	78*	13.5	.850 – 1.39	0.7779	17.73 / .7779	22.8	17.14
ATS2	0-44	29	13.5	.189 - .486	0.7779	4.77 / .7779	6.13	4.6

Two thousand four findings indicate that the length / weight comparison between the fall parr stocked in October and the fall parr stocked in 2003 were smaller. The 2004 fish had an average length of 101.1 mm and weight of 11.36 g whereas the 2003 fall parr averaged 106.3 mm in length and 13.5 g in weight. Post stocking electrofishing total catch (N=715) was significantly higher than 2003 post stocking (N=331).

Further electrofishing in the spring and fall of 2005 is planned to monitor 2004 releases. We also plan to stock fall parr in 2005 and repeat the experiment for an additional year.

Redd Counts

Three different reaches on the mainstem underwent redd count surveys (Nov. 15, 17, and 18). Each survey covered only portions of the spawning habitat; in part because of the extensive drainage area of the river, as well as time and personnel it takes to cover large expanses of habitat. No redds were found.

2. Habitat

Water Quality

Water temperature data were collected with thermograph units at nine sites. Thermographs were placed throughout the drainage starting at the northern most site: 1) Millet Road (River Kilometer 54.78), approximately 2.5 miles below Garland Pond in Garland; 2) Fernald Road (50.47 km) our research area; 3) French Stream (1.71 km); 4) Beans Mills Road crossing (44.7 km), at the start of heavy agriculture use; 5) Corinth Road crossing (40.4 km); 6) Covered Bridge (33.35 km); 7) Kenduskeag Village (28.55 km); 8) at the end of Ohio Street in Glenburn (21.53 km); and 9) Six Mile Falls (10.47 km). These sites were chosen in an attempt to gain a complete river temperature profile and to also identify areas of potential concern for high summer water temperatures. The upper river in Corinth is small and has greater canopy cover and spring water influences than the lower river. The lower Kenduskeag is wider and more exposed, allowing for significant daily fluctuations in temperatures. The lower river also has a greater agricultural land use.

See Table below

Site	River km	No. Days Sampled	No. Days Temperature		
			$\leq 22.4^{o}C$	$\geq 22.5^{o}C$	$\geq 27.0^{o}C$
French stream	1.71	89	72	16	1
Six Mile Falls	10.47	89	86	3	0
Ohio Street	21.53	89	60	28	1
Kenduskeag village	28.55	89	30	58	1
Covered Bridge	33.35	89	63	25	1
Corinth Rd	40.4	89	62	26	1
Beans Mills	44.71	89	70	17	2
Fernald Rd	50.46	89	81	8	0
Millet Rd	54.78	89	68	21	0

Temperature loggers were retrieved from the river by late November and the data will be analyzed during winter 2004-2005 and will be available in late spring by contacting the ASC.

ASC also took three water quality samples. These samples were taken during the spring run off, summer low flows, and fall rains. Data is available upon request. This data is being collected for a library of water quality data to be used as a whole in future years as baseline data. Central High School has also started a project monitoring water quality. The students are monitoring tributary water chemistry similarly to our above water quality-monitoring program. They area also monitoring flow at 5 unregulated areas on Kenduskeag Stream.

Obstruction Survey and Removal
During the fall of 2004, obstructions and beaver dam breaching took place on the 2nd and 3rd of November. Several beaver dams were located and breached. In order to reduce the number of beaver in selected areas, Global Positioning System (GPS) units were used to record Universal Transverse Mercator (UTM) coordinates, similar to latitude and longitude. The coordinates were given to local Animal Damage Control (ADC) personnel to aid in localized reductions of beaver populations.

KENNEBEC RIVER

The Kennebec River is located in Somerset, Piscataquis, Kennebec, and Sagadahoc counties. It flows 222 kilometers (km) from its source at Moosehead Lake to the head of Merrymeeting Bay. Encompassed in its 15,540 (based on 6,000 sq.m from the Foye et al report) square km basin, the Kennebec River has eight major tributaries along with numerous small streams. The river currently has a small population of Atlantic salmon confined to the portion of the river and its tributaries below the first impassable dam in Waterville. The Atlantic Salmon Commission (ASC) conducted the following activities in the year 2004 in an effort to document Atlantic salmon activities.

1. Population Monitoring

Electrofishing

We electrofished seventeen sites in three tributaries; Bond Brook, Togus Stream and Sandy River. All sites were evaluated using a single pass measured method except two sites in the Sandy River where a multiple-pass depletion method was used (Table 1).

Table 1. Summary of juvenile Atlantic salmon densities in the Kennebec drainage.

2004	River	Young-of-the -Year				Parr			
		Minimum	Median	Maximum	Sites	Minimum	Median	Maximum	Sites
	Sandy River	2.4	4.4	20.9	14*	0.2	2.9	9.8	7*
	Togus Stream	0.0	0.0	0.0	2	0.0	0.0	0.0	2
	Bond Brook	0.0	0.0	0.0	1	0.0	0.0	0.0	1

* Multiple pass removal method was used at two sites.

Redd Counts

Redd counts were undertaken by foot on tributaries of the Kennebec River in November. Tributaries surveyed during this period included Bond Brook, Sevenmile and Togus streams. No survey was completed on Messalonskee Stream due to high water. In addition, approximately 60% of the spawning habitat below Waterville on the mainstem Kennebec was surveyed by watercraft.

In general two surveys, one early and one late in the spawning season, are conducted to generate a final redd count. This is primarily due to the distortion of redds over time by high flows and the potential for late spawning. In 2004, due to high flows, only a single survey was completed on each tributary. We were unable to document any redds in any of the tributaries. However within the 60% of the mainstem surveyed two redds were found with the correct dimensions indicative of Atlantic salmon. It is possible that more spawning could have taken place either in the remaining 40% or after our survey was completed.

2. Habitat

Habitat Surveys

The ASC continued ongoing habitat surveys on tributaries of the Kennebec River to quantify adult salmon spawning and juvenile salmon-rearing habitat in the basin. Surveys were conducted on the mainstem Sebasticook River in Pittsfield and from Farmington to the mainstem Kennebec on the Sandy River. We document 351 units on the Sebasticook River, and 6,870 units of Atlantic salmon habitat on the Sandy River. One habitat unit equals 100 m^2 of juvenile Atlantic salmon habitat of riffles and runs combined.

Temperature Monitoring

Data loggers were deployed and set to record once every hour in the Sandy River watershed and Bond Brook watershed Augusta. A copy of this data can be obtained by contacting the ASC.

3. Meetings

Hydro Relicensing

ASC staff attended numerous meetings and field events associated with the hydro relicensings and or passage facility construction at Lockwood (Florida Power and Light), Sandy River (Town of Madison), Benton Falls (Benton Falls Hydro Associates), Burnham (Ridgewood Maine Hydro Partners), Anson and Abenaki (Madison Paper Industries) and Fort Halifax (Florida Power and Light) Projects. Additionally, ASC staff spent considerable time analyzing and commenting on Maine Department of Transportation projects within the watershed.

Presentations

ASC staff presented a poster at the alewife festival held by the Kennebec chapter of Trout Unlimited in Winslow. We also presented our streamside incubation project at the annual Kennebec Hydro Developers Group (KHDG) meeting.

4. Research

Streamside Incubation

The ASC incubated 130,000Atlantic salmon eggs streamside in experimental incubators in an effort to test the feasibility of streamside incubation as a low-tech inexpensive method of Atlantic salmon restoration. The eggs were incubated on a small tributary to the Sandy River and the resulting fry were released into the mainstem Sandy River in Madrid.

Instream Incubation

In the winter of 2004 the Sidney Office of The ASC tested instream incubation of green Atlantic salmon eggs for performance and use by volunteers as a restoration tool. Eggs were buried in commercially available incubators and left until June of 2004 when they were removed.

The results were however less than satisfactory. None of the incubators recovered showed any egg development. A review of our project leads us to believe that temperature differences between the hatchery and recipient water and inappropriate handling may be the cause of mortality.

MACHIAS RIVER

The Machias River is located in Washington and Hancock Counties. The river originates at Fifth Machias Lake and flows approximately 98 km to its confluence with Machias Bay in Machias. Major tributaries include Old Stream, Mopang Stream, and the West Branch Machias River. The Atlantic salmon population was listed as endangered by the National Oceanic and Atmospheric Administration Marine Fisheries Service (NOAA-Fisheries) and the U. S. Fish and Wildlife Service (USFWS) on November 13, 2000. The Atlantic Salmon Commission (ASC) conducted the following enhancement and management activities during calendar year 2004.

1. Population Monitoring

Adult Weir Operations

There is currently no adult trapping facility on the Machias. The adult population is primarily monitored via redd counts.

Electrofishing

We electrofished 11 sites in the Machias River drainage, using multiple-pass depletion methods to generate population estimates for juvenile salmon. Median density of parr was 3.3 parr per 100 m^2, with a minimum density of zero and a maximum density of 12.1 parr per 100 m^2. This median parr density is slightly higher than in 2003, and similar to 2002. Median density of young-of-the-year (YOY) was 15.3 YOY per 100 m^2, with a minimum density of 1.6 and a maximum density of 45.6 YOY per 100 m^2. These median and maximum YOY densities are the highest in 5 years.

Redd Counts

We counted a total of 59 redds, covering the majority of the spawning habitat in the Machias drainage. We counted redds created by both wild and stocked adult salmon. We released 100 salmon from the 2002 year class in the West Branch Machias at the outlet of Sabao Lake, a portion of which were expected to be sexually mature and possibly spawn in the river. We chose to release salmon in the West Branch in an area that was unlikely to see wild escapement, was isolated by distance and a number of beaver dams from the rest of the drainage, and had a discrete amount of habitat that we could monitor effectively for spawning activity. However, the salmon stocked at the outlet of Sabao Lake apparently moved down the entire length of the West Branch and into the mainstem of the Machias River, where they appeared to have constructed a number of redds. We counted 40 redds between the confluence of the West Branch and the end of spawning habitat below Route 9, but we can only infer that these were constructed by the stocked fish. We are confident that wild fish were in the system because we documented some preliminary spawning activity in the lower West Branch before the adults were stocked, and we also counted redds in other parts of the drainage that stocked fish were unlikely to have moved into. We feel fairly confident attributing the following redds to wild escapement: 12 redds in Old Stream, two in Chain Lakes Stream, and one redd in Mopang Stream. We counted four redds in the West Branch in the general areas where we had seen test pits before the adult fish were stocked. These redds may have been created by wild fish, but any conclusions are tenuous.

2. Population Enhancement

Stocking

We stocked 382,000 fry into appropriate habitat throughout the drainage. 341,000 were stocked in 2003. Ninety-eight hatchery surplus broodstock from the Craig Brook National Fish Hatchery (CBNFH) were stocked in the West Branch at the outlet of Sabao Lake during October.

Broodstock Collection

We collected 243 parr via electrofishing for transfer to the captive broodstock program at Craig Brook National Fish Hatchery (CBNFH).

3. Habitat

Habitat Surveys

The Machias River habitat survey has been completed and no new work was done in 2004. Recent habitat survey data will be incorporated into GIS by spring 2005.

Obstruction Surveys and Removal

Obstruction removals were conducted on Old Stream, Mopang Stream, and the Crooked River, where we breached 24 beaver dams. 13 obstructions were removed from Old Stream, one at the inlet to Second Machias Lake, seven from the Mopang and three on the Crooked River.

Water Quality

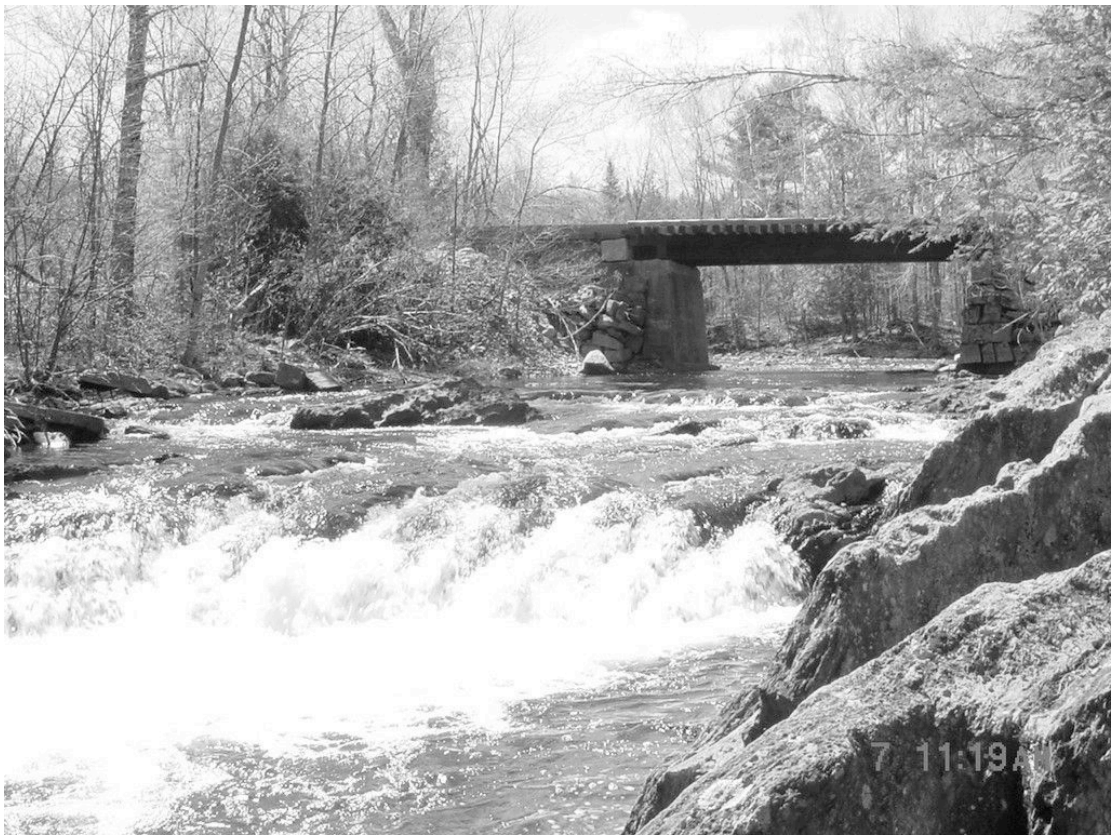
Water temperature data were collected at 13 sites in the Machias Drainage, five on the Machias River, three on Old Stream, two on the West Branch, and one each on Mopang Stream, Crooked River, and New Stream.

4. Public Meetings and Outreach

The ASC staff attended meetings of or engaged in activities with the Machias River Watershed Council, Downeast Watershed Coalition, Downeast Salmon Federation, and Project SHARE. All of these organizations work on salmon habitat and riparian habitat issues in the Machias River watershed.

MARSH STREAM

Marsh Stream is located in Waldo County. It flows approximately 48 km from its source at Upper Drake Pond to its confluence with the South Branch of Marsh Stream in Frankfort. The North Branch has only one major tributary, also named South Branch, which empties into the main stem just upstream of the West Winterport Dam. There are a number of smaller tributaries as well as intermittent streams. The North Branch of Marsh Stream has two small hydro dams located in the towns of Frankfort and West Winterport. The South Branch of Marsh Stream has three tributaries: Colson Stream, Hawes Stream, and Carley Brook. The Atlantic Salmon Commission (ASC), in an effort to restore salmon, conducted the following enhancement and management activities on Marsh Stream in calendar year 2004.



Upper section of Ledge Falls, Marsh Stream, at Crane Bridge in North Monroe (Photo by Peter Ruksznis, ASC)

1. Population Monitoring

Electrofishing

Seven electrofishing sites were sampled within the Marsh Stream drainage. These sites were sampled on August 11, 12 and 16. Brief one-run surveys were used to cover large expanses of habitat to determine the presence or absence of juvenile salmon. Since no YOY or parr were found in the North Branch in 2003, only areas with spawning and riffle habitat were sampled in 2004.

In the mainstem, two sites were chosen due to access and spawning habitat. The South Branch of Marsh Stream (Colson Stream, Hawes Stream) was also sampled and no salmon were found. Smallmouth bass were found throughout the upper North Branch drainage. Largemouth bass were also sampled this year, but they are known to be present in the river reach below Lower Drake Pond. Largemouth bass typically do not inhabit salmon habitat, so we do not generally find juvenile largemouth bass in our sample areas.

Redd Counts

No redd counts were conducted on either branch of Marsh Stream in 2004.

2. Habitat

Water Quality

The ASC recorded summer water temperature on Marsh Stream at five sites: above the Railroad Trestle, below West Winterport Dam, below Monroe Center Falls, Monroe Village, and Crane Bridge. Additionally, water temperature data will be collected by the ASC at two locations over the winter. All data will be analyzed during the winter months of 2004-2005 and information will be available from the ASC in late spring.

NARRAGUAGUS RIVER

The Narraguagus River is located in Washington and Hancock Counties. From its source at Eagle Lake in TWP 34MD, it flows approximately 78 km to tidal waters in Cherryfield and from there into Narraguagus Bay in Milbridge. The West Branch Narraguagus is its principal tributary. The Atlantic Salmon Commission (ASC), in an effort to restore the salmon, conducted the following enhancement and management activities in calendar year 2004.

1. Population Monitoring

Adult Weir Operations

We operated a fishway trap at the Cherryfield ice control dam from May 3 through November 1 to capture upstream migrating adult salmon and to intercept any escaped aquaculture salmon that may enter the river. In 2004 we captured a total of 10 adults, none of these were suspected to be of aquaculture origin. This year's trap catch represents a decrease of 11 salmon from the 2003 catch (n=21) and an increase of 2 salmon from the 2002 catch (n=8). However, we suspect the 2004 adult returns to be slightly higher based on the number of redds observed during redd counts conducted in mid-November (see section "Redd Counts" below). High river flows throughout the summer and fall may have given returning salmon an opportunity to pass over the ice control dam and avoid the fishway trap and therefore, not be counted.

Electrofishing

Juvenile salmon populations were assessed in the Narraguagus River by using backpack electrofishing units. A primary objective of the electrofishing assessments is to estimate pre-smolt abundance in Narraguagus River rearing habitats upstream of the smolt trapping locations. When coupled with the following year's estimate of smolt emigration, we can estimate parr survival through the winter prior to smoltification. NOAA manages the smolt trap data and computes the over winter survival estimates for each cohort of emigrating smolts from the Narraguagus River.

The parr abundance data are incorporated into the BGEST model (Basinwide Geographic and Ecologic Stratification Technique) to continue a time series of large parr (ages 1+ and **2+)** population estimates. ASC staff has been consolidating past Narraguagus River electrofishing trip data from multiple electronic sources into a Maine Salmon compatible database, using

Microsoft Access2000. New basin-wide juvenile salmon population estimates will be computed for the Narraguagus River during the winter of 2004, using the most recent set of individual site estimates of juvenile salmon abundance for the years 1957-2004.

We sampled for juvenile salmon at 39 Narraguagus locations in 2004, which is similar to effort in previous years. Eleven sites were located in tributaries to the Narraguagus River and 28 sites were located on the mainstem. We obtained multiple run population estimates at 29 sites. Other sites (n=10) were sampled with single pass electrofishing, which we conduct when parr are absent or present in extremely small numbers during the first run. Parr densities were variable among the sites sampled in the mainstem in 2004, with an absence of parr at some low quality sites, to a high of 7.91 parr/100 m^2 at Upper Bracey Ford (river km 63.57). Parr densities in tributaries were also variable among the sites sampled, ranging from an absence of parr to 21.64 parr/100 m^2 in Shorey Brook (river km 1.96). Parr densities tend to be highest in riffle areas with small boulder and cobble substrates.

During the parr surveys, we also collected abundance data for age-0+ parr (YOY). Densities were variable in mainstem sites, ranging from an absence of parr to18.20 per 100 m^2 at the Ford Riffle (river km 53.01). YOY densities in tributaries to the Narraguagus River ranged from 1.18 per 100 m^2 in Spring River (river km 3.33) to 24.37 per 100 m^2 at Shorey Brook (river km 1.40).

Redd Counts

We conducted redd counts on the Narraguagus River mainstem and three of its tributaries. The West Branch Narraguagus, a major tributary to the Narraguagus, contains relatively little spawning habitat and is logistically impractical for redd counts. We counted 23 redds on the mainstem and 10 test pits during the 2004 surveys. No redds or test pits were observed in the three tributaries surveyed (Sinclair Brook, Baker Brook, and Gould Brook). This year's count is larger than observed in 2003 (17 redds) and 2002 (6 redds), and represents less than 1% of what is needed to assure full habitat utilization.

2. Population Enhancement

Stocking

ASC staff assisted in the distribution of approximately 465,800 fry into the Narraguagus River in the spring of 2004. These fish were the offspring of wild parr collected as brood fish from the Narraguagus in previous years and reared to maturity at Craig Brook National Fish Hatchery by the U.S. Fish and Wildlife Service. They were distributed throughout the drainage in a manner designed to minimize interactions with naturally produced fry during their first year in the river. In addition, 291 adult salmon used for broodstock were released at the mouth of the Narraguagus near the tidewaters in Milbridge.

Broodstock Collection

We collected a total of 246 large parr during the 2004 electrofishing trips (ages 1 and 2) for captive rearing as broodstock to supply eggs for future Narraguagus River enhancement purposes. These fish were collected from 19 sites located throughout the drainage, and are believed to capture most of the genetic variability present within parr in the Narraguagus River.

From these broodfish, we collected length, weight, scale samples for age and growth analyses, and tissue samples (a partial caudal fin clip) for DNA fingerprinting of individual broodfish.

3. Habitat

The Narraguagus River mainstem habitat survey was completed in the mid 1990's.

Obstruction Surveys and Removal

While conducting electrofishing surveys, several beaver dams and/or debris jams were observed along the Narraguagus River mainstem that could possibly obstruct fish passage. However, high water levels caused by several rain events removed the majority of these obstacles. While conducting redd counts in early November we noted that these obstacles where still absent.

Water Quality

In 2004 Commission staff collected water temperature data from nine sites in the Narraguagus River. Eight sites were on the mainstem and one site was located at Sprague Falls on the West Branch Narraguagus. Water samples were collected for the ASC pH survey from five mainstem and five tributary sites. Full ion chemistry analysis was conducted at the University of Maine George Mitchell Center. A full water chemistry report is expected during summer 2005.

PASSAGASSAWAKEAG RIVER

The Passagassawakeag River is located the Towns of Waldo, Belfast, Morrill, Brooks, and Knox in Waldo County. It flows approximately 25 km from its source at Lake Passagassawakeag (Brooks) to its confluence with the Penobscot River estuary at Belfast Bay in Belfast. Wescott Stream is its only major tributary. ASC conducted the following assessment activity during calendar year 2004.

1. Population Monitoring

Electrofishing

In 2004, three electrofishing sites were sampled for juvenile salmon. The site at head of tide, Doak Farm, was sampled again this year for YOY and parr. YOY were found at a very low density. We also sampled YOY at a second site, the ravine, just above Doak Farm. The third site sampled, Rte. 137 bridge crossing, is located about 1.6 miles upstream of the Doak Farm site. This site consists primarily of cobble and small boulder. YOY salmon were also found at Rte. 137 but at a low density. This year's data contrasts with 2003 data when no YOY or parr were found.

Redd Counts

Redd counts were conducted on the Passagassawakeag River in 2004, since YOY were found at three electrofishing sites. Redds had not been found in previous years and spawning areas are not as prevalent as in other rivers. No redds were found in 2004.

2. Habitat

Water Quality

ASC recorded summer water temperatures on the Passagassawakeag River at two sites: Iron Bridge and Doak Farm. In addition to the summer collection of water temperature data, the ASC will also collect temperature data at one location throughout the upcoming winter months. All data will be analyzed during winter and spring 2004 – 2005 with information available from the ASC in late spring.

PENOBSCOT RIVER

The Penobscot River drains an area of 8,570 square miles, spans seven counties, and is Maine's largest river system. Annual runs of 40,000 to 75,000 Atlantic salmon were possible prior to the 1800's but the current estimated production potential for the river has declined to less than 12,000 adult fish due to habitat alteration and loss. Major tributaries to the Penobscot River include the East Branch, West Branch, Piscataquis, Passadumkeag, and Mattawamkeag rivers. In addition, four significant tributaries enter the tidal portion of the Penobscot River: Kenduskeag Stream, Souadabscook Stream, Cove Brook, and Marsh Stream. NMFS and USFWS listed the Atlantic salmon population of Cove Brook as endangered on November 13, 2000. The Commission, in cooperation with the USFWS, NMFS, MDIFW, PIN, USDA, and additional stakeholders, conducted the following enhancement and management activities in 2004.

1. Population Monitoring

Adult Trap Operations

Veazie Dam. We operated a fishway trap at the Veazie Dam from May 5 through October 29 to enumerate adult salmon returns to the Penobscot River, to collect biological data from individual fish according to established sampling protocols (age and origin, length, fish condition, etc.), and to observe fish for marks or tags applied to parr and smolts prior to their release from GLNFH. The trap is also used to collect mature sea-run salmon for use as brood stock.

We captured 1,323 sea-run salmon during 2004, releasing 714 salmon back to the Penobscot River. Thirty-five salmon were recaptured once after dropping downstream over the dam and ascending the fishway for a second time with four fish recaptured twice and two of these fish being recaptured a third time. All salmon released to the river were marked with an adipose fin punch (AP), or an upper caudal fin punch (tail punch, UCP) and most (709) were implanted with a Passive Integrated Transponder (PIT) tag to provide identification of recaptured salmon and prevent double counting. This year's total catch represents an increase of 211 fish from the 2003 total catch of 1,112 sea-run salmon.

Of the 1,323 sea-run salmon returning to the trap in 2004, 281 were 1 sea winter (1SW) fish representing 21% of the total run. The percent of 1SW fish (grilse) in the total run fluctuates yearly, and while this year's rate is below the mean of approximately 25% for the previous 17 years, it does fall within the normal range observed over this time period (11% - 48%). No

suspected aquaculture escapees were captured, but we did capture three captive-reared brood fish released from GLNFH in previous years, based upon the mark observed (healed adipose fin punch), scale circuli patterns, and body morphology. Two of the Green Lake brood fish were returning from one-year at sea and are reported as "new sea-run fish". The third appeared to be released in fall of 2003 with no detectable sea growth upon scale analysis. Thus, this salmon was not recorded as part of this year's adult catch.

We collected and archived adipose fin punches for DNA analysis from 1,317 of the 1,323 salmon captured at the Veazie trap. Scale samples were collected from 1,227 of the returning salmon, representing 93% of the total catch.

Of the 714 salmon released to the river in 2004, 194 were classified as female, representing a potential for deposition of approximately 1,435,600 eggs (~14 eggs/100m^2). Based upon the 102,575 units of salmon habitat documented in the Penobscot River drainage, the ASC established a conservation egg requirement of 24,618,000 (240 eggs/unit). Utilizing the long-term (1986-1997) average fecundity of 7,400 eggs per female, 3,327 spawning females are needed to fulfill the egg deposition target. This year's catch escapement to the river represents approximately 5.8% of the conservation target set for the Penobscot drainage.

Weldon Dam. Great Lakes Hydro America, LLC (GLHA) continued operation of an Atlantic salmon trap at the fishway at Weldon Dam. The dam is located 60 miles upstream from Bangor and is the fifth and final mainstem dam encountered by salmon on their upstream migration into the East Branch, Penobscot River. The trap was operated daily from June 10 through October 30. The 2004 trap catch (183 total salmon) consisted of 80 large salmon and 103 grilse. This catch represents a 357% increase over the previous year (40 salmon). All trapped fish were counted and permitted to swim from the trap without additional handling to minimize stress. GLHA, owners of the Weldon Dam, conducted radio telemetry studies in 2004 to evaluate a smolt downstream bypass system at the dam. Preliminary results suggest 40% bypass passage efficiency for smolts through the bypass facility. In addition, GLHA reported capturing 6,000 wild smolts utilizing the bypass system during a two-week trapping period.

Electrofishing

Penobscot River electrofishing surveys are typically among the last field assessments undertaken in the fall because of the lack of staff resources. In 2004, a small amount of staff time was reallocated to the Penobscot and sites in eight small tributaries were sampled for the presence or absence of juvenile Atlantic salmon. Three tributaries to the Mattawamkeag River (Big Gordon Brook, Little Gordon Brook, Mattakeunkam) and four tributaries draining directly into the mainstem Penobscot River (Mattaceunk Stream, Pollard Brook, Hoyt Brook, Hemlock Stream, Salmon Stream) were surveyed with juvenile salmon being found at four sites.

Site	Life Stage	Units (100 sq. m)	Total Catch	Lower 95% C.I.	Population Estimate	Upper 95% C.I.	One-Run Density
Big Gordon Bk.	YOY	2.15	41	41	45	51	10.21
Hemlock Str.	YOY	5.43	15	-	-	-	2.76
Mattakeunk Str.	Parr	8.31	8	8	8	8	0.72
Mattaceunk Str.	YOY	7.3	2	2	2	2	0.27
	Parr	7.3	14	14	15	18	1.37

Redd Counts

Annual redd count surveys are not a standard practice in the Penobscot watershed upstream of the Veazie dam due to the reliability of population data collected at the Veazie fishway trap, the relatively low spawning escapement, and the logistical challenges in locating small numbers of spawning salmon in such a large river system. The ability to locate spawning salmon was enhanced in 2004 by using data collected during a PIT tagging study that tracked salmon passing through fishways throughout the drainage. Using those data, biologists were able to target spawning habitat in the upper Pleasant River and documented the presence of 34 salmon redds there. Salmon spawning (two redds) was also documented in the upper Piscataquis River during a cursory survey near Barrows Falls. Redd counts were also conducted on the Seboeis River, a tributary to the East Branch, Penobscot River, in response to the increased passage of salmon (80 adults) above Weldon Dam in 2004. Biologists surveyed eight miles of excellent spawning and rearing habitat in the Seboeis River but did not detect any spawning activity. Volunteers from the Appalachian Trail Club also inspected portions of Wassataquoik Stream but did not report any spawning activity.

Pleasant River Smolt Trapping

In an effort to monitor smolt migration in the Pleasant River, two rotary screw smolt traps were deployed in the Pleasant in the Town of Brownville. We anticipated catching downstream migrating smolts from fall parr stockings of 91,338 fish in 2002 and 83,419 fish in 2003. All parr stocked were reared at the GLNFH and marked with a fin-clip prior to being released to the river (right ventral fin in 2002; left ventral fin in 2003). In addition, approximately 270,500 fry were stocked in the West Branch, Pleasant River and 44,850 in the Pleasant River so we were hopeful of also capturing unmarked smolts. A five-foot diameter trap was installed on April 30 and removed on May 18. A second smaller trap, four feet in diameter, was installed on May 11 and removed on May 24.

We caught 15 smolts on May 1 and over the nearly three and half weeks the traps operated, a total of 495 smolts were captured. Biological data (length, weight, scale sample, genetic sample, fin-clip, smolt score, fin score) was collected and a temporary mark (upper caudal fin clip) to track subsequent recapture was applied to each smolt prior to release back to the river. Of the 495 smolts captured, 206 (41.6%) were unmarked; 240 (48.5%) had a right ventral fin-clip indicating a hatchery parr released in 2003; and 49 (9.9%) originated from 2002 GLNFH releases. Average lengths and weights for unmarked smolts and smolts from the 2002 stocking were similar with unmarked smolts averaging 164 mm in length and 42.0 g in weight whereas the hatchery parr averaged 159 mm and 37.2 g. Smolts emanating form the 2003 stocking were smaller, averaging 138 mm and 23.9 g.

Rotary Screw Smolt Traps, Pleasant River, Brownville. (Photo by Peter Ruksznis, ASC)

2. Population Enhancement

Stocking

Approximately 1,796,000 fry were stocked into select nursery habitat in the East Branch, Penobscot River, Piscataquis, Pleasant, and Mattawamkeag rivers in May 2004. These fry were incubated, hatched, and released according to genetic family groups to provide biologists with a "genetic marker" for assessing the growth and performance of the stocked fry. Analysis of the genetic makeup of adults produced from these fry stockings will help evaluate the potential contribution fry stocking to subsequent adult returns; and provide data regarding the relative productivity of different areas of the Penobscot watershed.

A total of 566,000 smolts were stocked in the spring of 2004 with an additional 369,000 parr released in the spring and fall into the mainstem Penobscot, Mattawamkeag, Piscataquis, and Pleasant rivers as a stock enhancement measure. All parr were marked and distributed in manner that would minimize conflict with other ongoing management or research activities in the Penobscot watershed.

Brood Stock Collection

We transported 606 salmon to Craig Brook NFH for use as brood fish. All adult brood stock collected from the Penobscot River were implanted with individually coded PIT tags at the time of capture. This year CBNFH personnel took blood samples for disease screening from 60 brood

fish prior to their release into hatchery pools. Despite the additional handling stress resulting from the disease sampling, pre-spawning mortalities among 2004 brood stock at CBNFH were low (<0.5%), as has been the case in recent years.

3. Habitat

Habitat Surveys

Acquisition of detailed habitat data and updating of historic smolt production estimates are a high priority for management activities on the Penobscot River. Intensive habitat surveys of prime rearing areas in the East Branch, Penobscot River; Wassataquoik Stream; Seboeis River; West Branch, Mattawamkeag River; Pleasant River; and upper Piscataquis River have been completed since 2001. Biologists succeeded in surveying and mapping the entire length of the mainstem Mattawamkeag River (50 miles) in 2004. Habitat crews also surveyed a section of the Piscataquis River between the towns of Abbot and Dover-Foxcroft. Data will be used to develop appropriate stocking recommendations and assess spawning and smolt production potential of these areas.

Water Quality

Water temperature data loggers were deployed at 18 sites in the watershed in 2004, including all major tributaries that are stocked with fry. New temperature data loggers were purchased in 2004, but some units were incorrectly calibrated by the manufacturer resulting in loss of temperature data at several sites. Preliminary analyses suggest that water temperatures were moderately cooler in 2004 compared to the excessively warm temperatures observed in 2003. These data will contribute to the time series dataset and be used to help assess habitat suitability and the potential impact of water temperature regime on the growth and survival of juvenile Atlantic salmon. ASC staff is in the process of standardizing data collection and data management procedures and preparing a comprehensive report on water temperatures in Maine rivers managed for Atlantic salmon.

4. Fish Passage

Monitoring Fishways

Effective fishway operation is essential for returning Atlantic salmon to pass dams and access headwater spawning areas. Fishways were inspected on a routine basis in 2004 in conjunction with a project utilizing Atlantic salmon tagged with Passive Integrated Transponder (PIT) tags. Fishways were visited twice each week to download data from the PIT tag data loggers at the detection arrays and to maintain equipment. Visits ensured that fishways were operating properly and that hydro dam operators complied with appropriate maintenance procedures. Inspections were routinely conducted at four dams on the Piscataquis River (Howland, Brown's Mill, Moosehead Energy, and Guilford Industries); at the Pumpkin Hill Project on the Passadumkeag River; and five mainstem Penobscot River dams (Veazie, Great Works, Milford, West Enfield, and Weldon). Improper fishway maintenance and operation practices were rare, relatively minor in nature, and were readily corrected by dam operators upon notification.

PENOBSCOT PIT TAG PROJECT

This past field season (2004) was the third and final year of a cooperative research project between the ASC, USFWS, NMFS, PIN, and the U. S. Geological Survey's Conte Anadromous Fish Research Center (Conte). The study is investigating the spatial and temporal movements of sea run Atlantic salmon tagged with PIT tags during their upstream migration in the Penobscot River basin. In early spring, PIT tag receiver antenna arrays and data loggers were installed at the downstream entrance and upstream exit of five Penobscot River mainstem dam fishways (Veazie, Great Works, Milford, West Enfield, Weldon). Antenna arrays were also installed at three fishways on the Piscataquis River (Howland, Moosehead Energy, Brown's Mills) and at one fishway on the Passadumkeag River (Pumpkin Hill). ASC contract personnel downloaded remote fishway PIT tag data loggers weekly.

We released 709 PIT tagged Atlantic salmon to the river in 2004 compared to 460 in 2003 and 378 in 2002. Data collected from the data loggers are imported into a Microsoft Access database, audited, and analyzed to determine fish movement patterns. This past field season's data is presently undergoing analysis. A University of Maine graduate student will be presenting some of the results of this study as part of a M.S. dissertation in 2005.

Fish Passage Consultation and Review

ASC staff participated in several meetings and consultation reviews involving the following projects: Weldon, Medway, West Enfield, Howland, Milford, Stillwater, Orono, Great Works, and Veazie. With the exception of the Weldon Dam Project (Mattaceunk), all projects are included in the Penobscot River Restoration Project, either through proposed project decommissioning (Veazie, Great Works, Howland) or project modification to enhance hydropower production (Medway, West Enfield, Milford, Stillwater, Orono). Staff also attended the annual meeting of the Matagamon Lake Association as part of yearly consultation on Matagamon Lake level management and minimum flows into the East Branch, Penobscot River.

PLEASANT RIVER

The Pleasant River is located in Washington County. It originates at Pleasant River Lake and flows approximately 45 km to the head of tide in Columbia Falls. Tributaries include the Eastern Little River, Western Little River, and Bog Brook. The Atlantic salmon population was listed as endangered by the National Oceanic and Atmospheric Administration Marine Fisheries Service (NOAA-Fisheries) and the U. S. Fish and Wildlife Service (USFWS) on November 13, 2000. The Atlantic Salmon Commission (ASC) conducted the following enhancement and management activities during calendar year 2004.

1. Population Monitoring

Adult Weir Operations

We operated a weir, located upstream of the Route 1 bridge, from May 19 to November 01 to trap upstream migrating adults for the purposes of enumerating the wild adult run, collect biological data, and to intercept suspected escaped aquaculture fish. Two salmon were trapped, one multi-sea winter male which was released upstream, and one short-absence hatchery smolt stocked in May and also released upstream. This is similar to last year when one multi-sea winter fish was released upstream. Weir operation was interrupted during August 14 and 15 when the weir was inoperable due to unusually high river levels and debris. It is possible adult fish could have passed over the weir during this time.

Electrofishing

We electrofished 3 sites in the Pleasant River drainage, using multiple-pass depletion methods to generate population estimates for juvenile salmon. This is a decrease in the number of sites from the previous year because high water in late summer and early fall prevented us from more extensive sampling. Median density of parr was 5.5 parr per 100 m^2, with a minimum of 0.5 and a maximum of 22.7 parr per 100 m^2. Median density of young-of-the-year (YOY) was 20.8 YOY per 100 m^2, with a minimum of zero and a maximum of 45.9 YOY per 100 m^2. Recent stocking of the river with fry has increased the densities of YOY and parr in the last two years. The Eastern Little River is notable for high production of both YOY and parr. Fry reared at the Pleasant River Hatchery appear to perform at least as well as fry reared at Craig Brook National Fish Hatchery.

Redd Counts

No redds were found in the Pleasant River in 2004. We expected very few or no redds due to the fact that only one male was known to be in the river. In 2003, high water prevented us from counting redds on most of the Pleasant. Therefore, we attempted to look for 2003 redds while fry stocking this year, but we did not find any.

2. Population Enhancement

Stocking

Salmon were again stocked into the Pleasant drainage in 2004. We stocked 35,000 fry reared at Craig Brook National Fish Hatchery (CBNFH). An additional 12,000 fry reared at the Pleasant River Hatchery (PRH) were stocked by the Downeast Salmon Federation and volunteers. This compares to 42,000 CBNFH and 9,500 PRH fry in 2003. Fry from the PRH were stocked by Pleasant River Watershed and Downeast Salmon Federation staff. We also stocked 8,800 smolts reared at CBNFH in 2004.

Broodstock Collection

We collected 102 parr for broodstock from two sites in the Pleasant River mainstem.

3. Habitat

Habitat Survey

The Pleasant River habitat survey has been completed and no new work was done in 2004.

Water Quality

Water temperature data were collected at eight sites in the Pleasant River drainage: six on the mainstem, and one each on the Eastern and Western Little Rivers. The Western Little River site is new this year.

4. Public Meetings and Outreach

ASC staff attended meetings of or engaged in activities with the Downeast Watershed Coalition, Downeast Salmon Federation, and Project SHARE. All of these organizations work on salmon habitat and riparian habitat issues in the Pleasant River watershed.

PRESUMPSCOT RIVER

The Presumpscot River is located in Cumberland County. It flows from its source, Sebago Lake in Windham, for 39 kilometers (km) to Falmouth. Even though there are nine dams obstructing fish passage on the Presumpscot River, a short section below Cumberland Dam is free flowing to tidal water. Within the free flowing portion there are two major tributaries (Mill Brook and Piscataqua River). The status of the Atlantic salmon resource in this river is currently unknown. In an effort to document available Atlantic salmon habitat the Atlantic Salmon Commission (ASC) has undertaken the following activities in the year 2004.

1. Habitat

Habitat Surveys

The ASC surveyed the upper portion of Mill Brook located in Westbrook. The survey documented 237 units (unit=100 m^2) of Atlantic salmon habitat. We will continue the survey in 2005.

Upper reach of Presumpscot Falls on the Presumpscot River in Falmouth, Maine. These falls were underwater for more than 200 years, but thanks to the removal of the Smelt Hill Dam this section of river is now free flowing and allows unfettered fish passage.

SACO RIVER

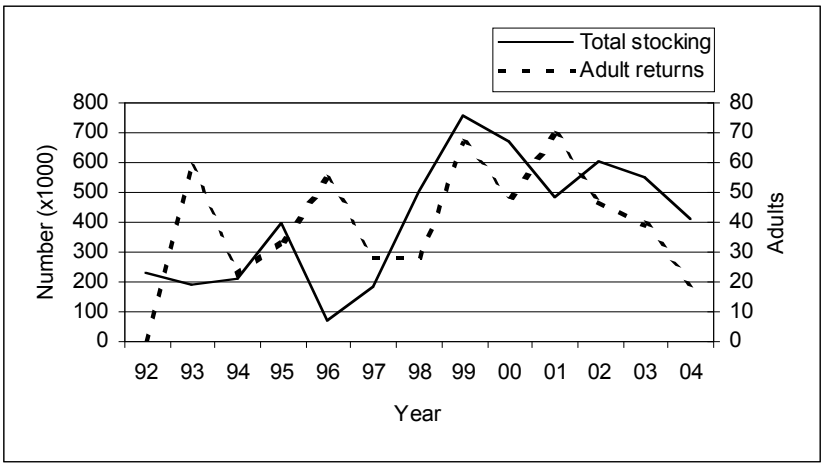
The Saco River watershed drains an area of 4,395 square kilometers (km) of which 2,253 square km are located in east-central New Hampshire and 2,142 square km in southwestern Maine (York and Oxford counties). The Saco River flows from its headwaters in the White Mountains of New Hampshire 64 km to the Maine border in Fryeburg were it flows an additional 137 km to the Atlantic Ocean in Saco and Biddeford. It has two large tributaries in Maine, the Ossipee and Little Ossipee rivers. The Saco River has a small Atlantic salmon population currently maintained by annual releases of hatchery stocks and limited natural reproduction. In an effort to manage and restore Atlantic salmon to the Saco River, the Atlantic Salmon Commission (ASC) and stakeholders conducted the following activities in calendar year 2004.

1. Population Monitoring

Adult Traps

Florida Power and Light (FPL) currently operates three fish passage-monitoring facilities on the Saco River. The Cataract fish lift, located on the East Channel in Saco was operational from early May to late October. This year 8 salmon were lifted and passed into the Cataract headpond from this facility. On the West Channel in Saco and Biddeford, the Denil fishway-sorting facility was also operational from early May to late October. This facility passed 11 salmon into the headpond. A third passage facility at Skelton Dam was used to re-capture adult salmon for transport to the Ossipee River. FPL transported and released 17 salmon from this facility. Historical stocking and returns can be seen in Figure 1.

Figure 1. Saco River historical stocking of all age classes of Atlantic salmon and adult returns.



Electrofishing

The ASC sampled 4 sites on 3 tributaries in the Saco River drainage. All four sites were evaluated using a single run, two or three-pass depletion methods (Table 2).

Table 2. Summary of juvenile Atlantic salmon densities at three sites in the Saco River drainage.

2004	River	Young-of-the -Year				Parr			
		Minimum	Median	Maximum	Sites	Minimum	Median	Maximum	Sites
	Ossipee River	0.3	2.0	3.7	2	0.5	0.6	0.7	2
	Pugsley Brook	2.9	2.9	2.9	1*	8.0	8.0	8.0	1*
	Back Brook	8.3	8.3	8.3	1*	11.7	11.7	11.7	1*

* Multiple pass removal method was used.

Redd Counts

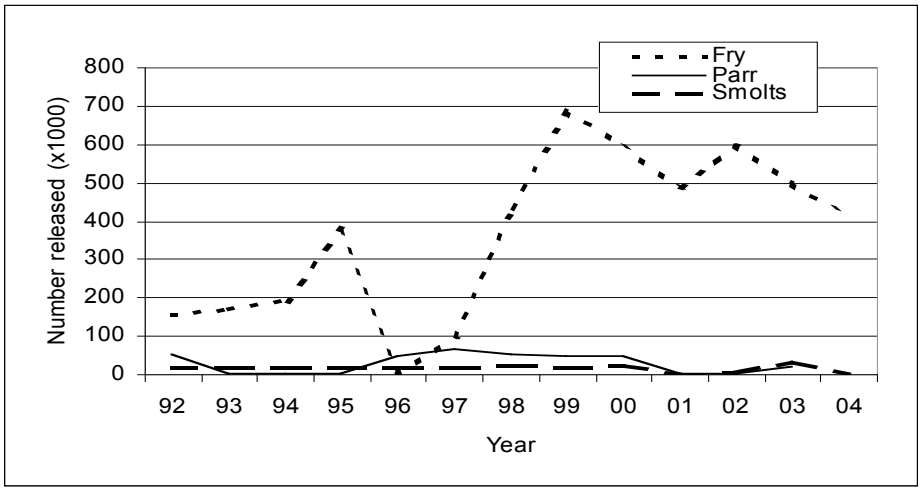
A single survey was made on November 10 in the Ossipee River from Kezar Falls to Cornish. We documented 14 redds.

2. Population Enhancement

Stocking

In 2004 one life stages of Atlantic salmon were released into the Saco River drainage. The Saco River Salmon Club (SRSC) and ASC distributed approximately 407,000 Atlantic salmon fry into the Ossipee River and 24 tributaries. The fry were produced from eyed eggs provided to the SRSC by the ASC. Figure 1. shows all salmon stocking activity since 1992.

Figure 2. Historical stocking of fry, parr and smolts into the Saco River.



3. Meetings

Saco River Salmon Club

ASC staff attended monthly meetings in an effort to exchange information and keep informed on Club activities.

Bar Mills Facilities

The ASC staff attended meetings concerning the relicensing of the Bar Mills project.

Saco River Coordinating Committee

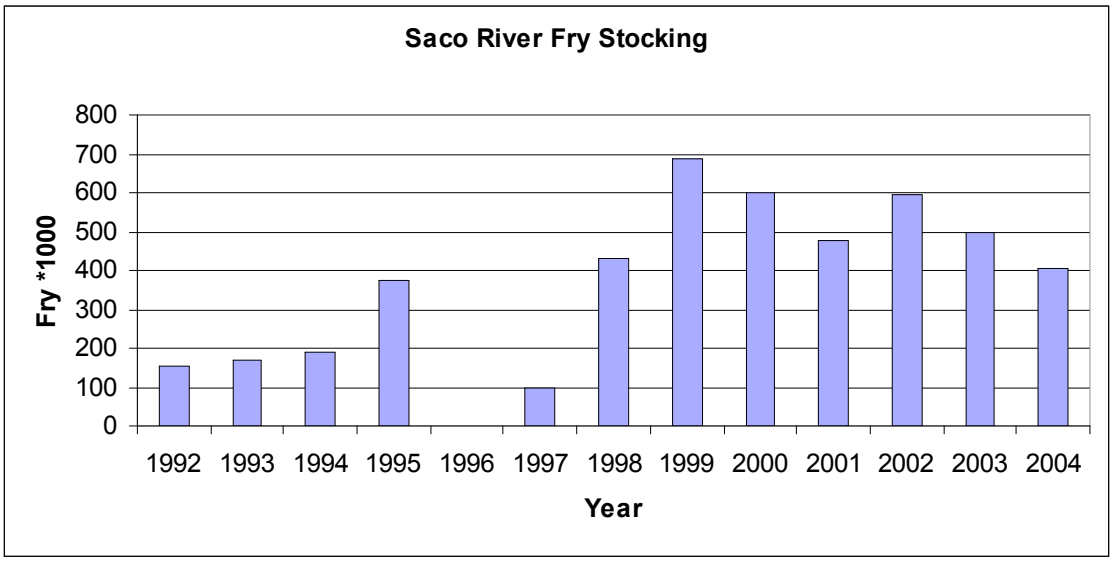
We also attended many meetings regarding the upcoming assessment and planning cycle which will guide all anadromous restoration activities for the next four years.

THE SACO RIVER SALMON CLUB

The Maine Atlantic Salmon Commission (ASC) is mandated to restore Atlantic salmon to all waters where they were historically found. The ASC has, since its original formation in 1947 as the Atlantic Sea Run Salmon Commission, worked to meet the many challenges associated with such an arduous task. However, despite all of its work the ASC is not able to work on all rivers. The ASC relies on partnerships to accomplish its goals on many of these rivers. One of the most important partners the ASC is working with is the Saco River Salmon Club (SRSC).

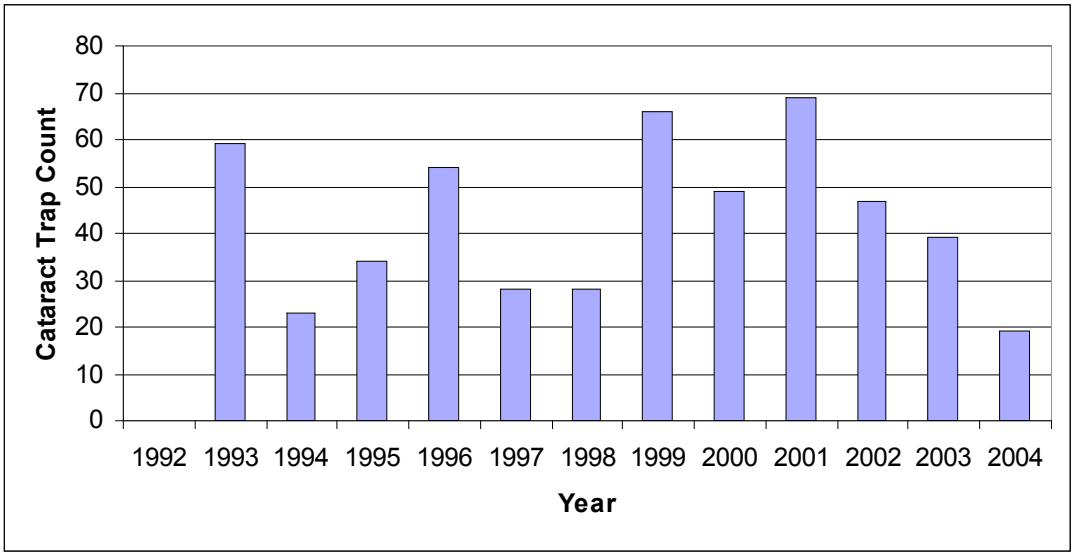
In 1982 the SRSC started from a small group of anglers, conservationists, and scientists, interested in anadromous fish passage issues associated with FERC relicensing of Saco River dams, and helping resource agencies stock USF&W produced smolt in the Maine watershed of the Saco. By 1991 the SRSC took on responsibility for producing and stocking all the salmon fry for the restoration by constructing a hatchery in Bar Mills specifically for the Saco. The original hatchery was a 400,000 capacity, flow-through operation designed and constructed by club volunteers and operated through 1995. In 1996 a new recirculating hatchery was constructed in Biddeford on a site provided by the Maine Department of Conservation at the Marblehead Boat Launch in Biddeford. As the SRSC's confidence in raising salmon grew they accumulated more equipment and increased incubator capacity to 1.6 million eggs. In 1999 the hatchery started producing fed fry. The hatchery has produced over 4.5 million fry since 1992 (Table1).

Table 1. Number in thousands of Atlantic salmon fry stocked in the Saco River drainage.



The Saco River currently has the second largest adult salmon return in the State of Maine. More than 500 adults have returned since the club started their activities (Table 2).
SRSC has played an important part in maintaining such a large run.

Table 2. Adult Atlantic salmon returns to the Saco River.



In recent years SRSC has expanded into outreach and other restoration activities. It distributes salmon eggs to 'Fish Friends' school programs in the Saco drainage, some 10,000 eggs to about 35 classrooms in 25 schools. The Fish Friends program supplies equipment and eggs to be used as educational tools in the science classrooms. In cooperation with FPL, the dam operators, SRSC also gives guided educational tours of the hatchery to some 1,500 Southern Maine students each year, and provides other tours and programs upon request.

In 2002 SRSC started habitat surveying streams in an effort to improve management. The surveys quantify the amount and distribution of habitat in each stream that salmon are released. This information help the ASC make salmon management recommendations. SRSC also collects water quality information about the streams that are being stocked. They deploy up to five temperature loggers annually to generate thermal profiles to assess salmon survival and habitat quality

The latest activity for SRSC is to produce smolts. The club partnered with MariCal Company, a company testing innovative techniques in treating parr to prepare them for ocean life, and the Pine Tree Trout hatchery in Sanford. The partners are attempting to produce 15,000 smolts for stocking in 2005, 25.000 by 2007, and to 50,000 soon after.

By 2004 the club had more than 200 paid-up individual and family memberships, plus many business sponsors. Amazingly it does not receive any federal or state funding and relies entirely on private donations and grants. The SRSC is one of the ASC's most valuable partners and instrumental in the Saco Rivers Atlantic salmon restoration program.

SHEEPSCOT RIVER

The Sheepscot River drains portions of Kennebec, Waldo, and Lincoln counties. The mainstem, originating in West Montville, flows 55 kilometers (km) to the head of tide in Alna. The West Branch originates at Branch Pond and flows 24 km to its junction with the mainstem in Whitefield. The second largest tributary, the Dyer River, empties into the Sheepscot River

estuary at the Town of Sheepscot. The National Marine Fisheries Service (NMFS) and the U.S. Fish & Wildlife Service (USFWS) listed the Atlantic salmon population in the Sheepscot River as endangered on November 13, 2000. ASC staff, along with various stakeholders, conducted the following enhancement and management activities in calendar year 2003 on the Sheepscot River.

1. Population Monitoring

Electrofishing

Twenty-seven sites were electrofished by ASC staff to assess juvenile Atlantic salmon populations. Six sites were long term monitoring index sites whereas twenty one sites were used to estimate basinwide parr populations. A summary of this data can be obtained by contacting the Commission Sidney office and will be available through the Sheepscot River KRISS by February 28. The website below is currently password protected, but will be available to the public in 2005.
(http://www.krisweb.com/krissheepscot/krisdb/html/krisweb/index.htm)

Redd Counts

One survey of the spawning habitat throughout the entire river was conducted. A total of eight redds were located: six between the IF&W Palermo Hatchery and Coopers Mills on the mainstem, one between Kings Mills and Headtide, and one on West Branch.

2. Population Enhancement

Stocking

The Commission and USFWS stocked 250,000 fry, 15,000 parr, and 94 post spawn adults Atlantic salmon into the Sheepscot River during 2004. The parr, averaging approximately 80 mm in length, were stocked from Kings Mills to Head Tide. This alternative stocking strategy was begun because electrofishing surveys documented low first year fry survival of in the Long Rips area.

Broodstock Collection

The Commission and USFWS collected 175 parr by electrofishing for transfer to the captive river specific brood stock program at the Craig Brook National Fish Hatchery.

3. Habitat

Water Quality

The Commission is recording water temperature at 22 sites within the Sheepscot watershed. In addition to the summer water temperature data, selected loggers will remain in the river throughout the winter months. Data will be analyzed during early 2005 with information becoming available from the ASC and on KRISS in early spring.

Obstruction Survey and Removal

Due to high water, obstruction removals were not necessary in 2003.

4. Meetings

Commission staff attended monthly meetings of the SRWC and meetings associated with passage issues at the Coopers Mills Dam. Further, Commission staff attended a series of KRISS workshops and meetings to develop the Sheepscot River Water Quality Monitoring WQM Plan and finalize action items associated with recommendations in the plan.

SOUADABSCOOK STREAM

Souadabscook Stream is located in Penobscot County. It flows approximately 35 km from its source at Etna Pond in the towns of Etna and Carmel to its confluence with the Penobscot River in Hampden. Souadabscook Stream drains an area of 203 sq. miles. Souadabscook Stream has a number of tributaries, the largest being the West Branch, Souadabscook Stream, which flows approximately 10.5 miles (17 km) from its source the confluence of Jordan Brook in Newburgh. Smaller tributaries include Wheeler Stream, Ward Stream, Black Stream, Harvey Brook, Tracey Brook, and Hill Brook. Souadabscook Stream had four small dams in the recent past: one hydro dam and three small flow control dams. Two of these smaller dams are still present, one has a slot cut into it to allow a year round concentrated flow. This dam is also used for an alewife trapping operation and an eel weir. The second dam is located above the Emerson Mill Road and is passable at normal flows. A hydro dam located directly under the Rte.1 Bridge crossing in Hampden and another low head dam used to store water above the Hampden Recreational area were removed in 1999. ASC conducted the following enhancement and management activities on Souadabscook Stream in calendar year 2004.

Souadabscook Stream at the confluence with the Penobscot River near Route 1A, Hampden (Photo by Randy Spencer, ASC).

1. Population Monitoring

Electrofishing

Electrofishing surveys were conducted on September 7, 2004. Three sites were sampled: Laskey Lane, below the recreational area, and above the recreational area. A single YOY was found at the lower recreational site, along with three smallmouth bass. The local Fish Friends program from Reeds Brook Middle School uses this area as its stocking area since the site is easily accessible. Reeds Brook Middle School received 200 eggs in the fall of 2003 and incubated them over the winter months. The school stocked 135 live fry in May 2004. We believe that the single YOY found came from the fish friends stocking.

Redd Counts

There were two attempts to find redds on Souadabscook Stream in 2004, on November 16 and 17. The area below the recreational area was walked and three salmon redds and two test digs were found. The following day, a greater area was canoed and one additional redd was found. The West Branch of the Souadabscook was surveyed on November 9. No salmon activity was recorded in the 4.8 mile (7.66 km) long area surveyed from Boyington Road to Rte. 202 in Hampden.

2. Habitat

Obstruction Surveys and Removal

During the fall of 2004, obstructions and beaver dam breaching was conducted on October 28. One old inactive beaver dam was further demolished in the event water levels continued to recede preventing upstream migration of fish.

Water Quality

ASC recorded summer water temperatures on Souadabscook Stream at three sites: below the Emerson Mill Road Bridge, Hampden Recreational Area, and at Laskey Lane. MDEP also collected water quality data from Souadabscook Stream. Water temperature data will also be recorded by the ASC at one location over the winter. All data will be analyzed during the winter 2004-2005 and will be available from the ASC in late spring.

ST. CROIX RIVER

The St. Croix is the easternmost river in the United States, and forms the Canada-U.S. boundary in southern Aroostook and Washington counties. Atlantic salmon management is conducted by cooperating agencies from two nations. The East Branch, from Vanceboro to Grand Falls Flowage, and the mainstem, from Grand Falls to Calais, are the focus of current Atlantic salmon restoration efforts. The West Branch, which joins the East Branch to form the main river at Grand Falls Flowage, is intensively managed for inland game fish. The Atlantic Salmon Commission cooperated with New Brunswick Department of Natural Resources (NBDNR), Canadian Department of Fisheries and Oceans (DFO), Maine Department of Marine Resources (DMR), Maine Inland Fish and Wildlife (MDIFW), NOAA Fisheries, the St. Croix International Waterway Commission (SCIWC), United States Fish and Wildlife Service (USFWS), and other stakeholders to conduct the following enhancement and management activities in 2004.

1. Population Monitoring

Adult Trap Operations

The SCIWC operated a fishway trap at the Milltown Dam, St. Stephens, New Brunswick, Canada, located near the head of tide, from 20 April to 29 October, to trap upstream migrating adult salmon for the purposes of enumerating returning sea-run salmon, collecting broodstock, screening for infectious salmon anemia virus (ISAV), and to intercept suspected escaped aquaculture salmon. The Milltown trap captured 14 salmon in 2004, compared to 15 in 2003. One was a river-origin male, nine were hatchery origin restoration fish (6 male, 3 female), and four were suspected aquaculture escapees that were sacrificed. One female hatchery-origin restoration salmon was misidentified as an aquaculture fish and killed. All other salmon were retained for broodstock and moved to Mactaquac Hatchery for spawning. The four suspected aquaculture escapees captured in 2004 is less than half of the nine escapees captured in 2003. Complete biological data was recorded for all aquaculture escapees prior to their destruction.

Electrofishing

No electrofishing was conducted on the St. Croix River in 2004.

Redd Counts

All returning adults are diverted to Mactaquac Biodiversity Facility for broodstock. Therefore, there is no escapement of adult salmon upstream of Milltown Dam. In addition, no adult salmon were stocked into the St. Croix River in 2004; therefore no redd counts were conducted.

Smolt Trapping

The SCIWC conducted smolt trapping in 2004 at the Milltown Dam downstream fish passage from 3 May to 31 May. Forty-nine smolts were captured and the origins of the smolts were determined by marks: 18 Penobscot strain smolts stocked from Green Lake National Fish Hatchery (GLNFH), 24 St. Croix strain smolts stocked as fall parr from Mactaquac Biodiversity Facility, and seven river-reared smolts.

2. Population Enhancement

Stocking

Salmon were again stocked in the St. Croix drainage in 2004. ASC personnel stocked approximately 4,000 smolts reared at GLNFH. Additionally, DFO and the SCIWC raised and released 2,800 age 0+ parr, commonly called "fall parr," in appropriate habitat. This compares to 16,779 fall parr stocked in 2003, and a record high of 124,000 fall parr in 1997. The Atlantic Salmon Federation Fish Friends program stocked a small number of fry (less than 500).

Broodstock Collection

Since 1996 all sea-run salmon captured at the Milltown trap have been retained for broodstock. Broodstock are held in onsite holding tanks pending pathology screening (ISAV, etc.), and then transported to the DFO Mactaquac Biodiversity Facility for spawning. All fish have tested negative for ISAV since screening was initiated in 2000. Fry produced from these broodstock are returned to the Milltown dam site and raised in tanks to fall parr size. Of the nine fish retained as broodstock two died in captivity before spawning (1 male, 1 female), seven were spawned, six were subsequently returned to the river, and one was lethally tested for diseases. The shortage of female salmon was addressed by DFO's addition of five female Tobique strain salmon to the spawning pool.

3. Habitat

Water Quality

ASC did not perform water quality work on the St. Croix in 2004. However, a variety of water quality monitoring activities were undertaken by the SCIWC.

Bass and Alewife Interaction

A report commissioned by the International Joint Committee (IJC) to summarize and review the available scientific literature regarding potential biological interactions between alewives and smallmouth bass has been drafted. Final comments have been submitted by ASC and other agencies, and the final report should be available in 2005.

Fish Passage

Fish passage remains an important issue on the St. Croix River, particularly for alewives, which may play an important role as a diversionary prey item in reducing predation on salmonids, as well as a source of marine-derived nutrients for the system. In 2004, approximately 1,300 alewives entered the Milltown Dam trapping facility, and 400 were trucked to upriver spawning habitat. This compares to 6800 alewives trapped in 2003.

4. Public Meetings and Outreach

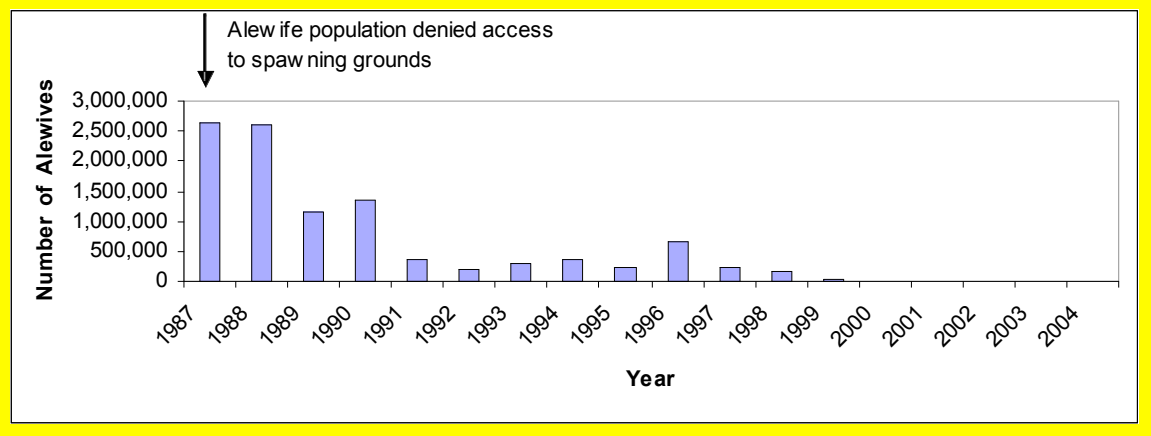
ASC staff attended meetings or engaged in activities with the St. Croix Fisheries Steering Committee, International Joint Committee, Maine Rivers, and SCIWC. All of these organizations work on salmon habitat and riparian habitat issues in the St. Croix River watershed.

5. Special Issues

Declining Alewife Population in the St. Croix System

Alewives remained the focus of fish passage issues on the St. Croix in 2004. Alewives are a native species of the St. Croix ecosystem and play an important role as a "diversionary" prey item in reducing depredation of migrating salmon smolts, and as a source of marine-derived nutrients. The alewife population has declined precipitously on the St. Croix River as a result of denying Alewives fish passage in to Spednick Lake.

Figure 1. St. Croix Alewife returns from 1987 – 2004.



Note: number of returning alewives is too small to be see on the graph for years 2000-2004.

Alewives were denied access to Spednik Lake in 1987 at the request of IFW because of concerns that high alewife abundance might be contributing to the concurrent declines observed in the smallmouth bass (*Micropterus dolomieu*, an exotic sportfish) population. In 1991, Fisheries agencies agreed to also close the Grand Falls fishway (for three years), later extending the closure for an additional year to facilitate ongoing research. The Maine State Legislature passed legislation in 1995 to keep the Spednik Lake, Grand Falls, and Woodland fishways closed to alewives indefinitely, thus eliminating access to 99% of the alewife spawning habitat. By 2000, the run had declined to fewer than 9,000 alewives. In response to this decline, the St. Croix Fisheries Steering Committee, which includes an ASC representative, reached a compromise for re-opening the fishways with a conservative spawning escapement of 90,000 alewives (4 fish/acre) above Grand Falls. The Maine State Legislature considered and rejected legislation to reopen the Grand Falls and Woodland fishways in 2001. The USFWS voiced opposition to closure of these fishways, which were constructed with contributions of USFWS funds, and felt that it violated the terms of the fishway construction grants. In November 2002, the USFWS acknowledged that their 25-year vested interest in the dams had expired and operation of the fishway was at the discretion of the state. The DFO has responded by trapping and trucking alewives, as available, from the Milltown trap to spawning habitat in the Woodland headpond dam since 2001. Due to continued poor returns, the number of alewives trucked has been only a small fraction of the 90,000 recommended by fisheries biologists. In 2004 approximately 1,300 entered the Milltown Dam trapping facility and 400 alewives were trucked to upriver spawning habitat, compared to 6800 alewives in 2003.

ST. GEORGE RIVER

The St. George River is located in Waldo and Knox counties. It flows from its source, Lake St. George in Liberty, for 56 kilometers (km) to Thomaston and Warren. The entire river has recently become accessible to anadromous fish with the removal of the Sennebec Dam in 2002. Adults access to the system Atlantic salmon has recently been restored, to build on the habitat survey and juvenile population surveys conducted in 2003, the Commission undertook the following activities in 2004.

1. Population Monitoring

Redd Counts

One survey was conducted on the middle and lower portions of the river. A total of three redds were located: two above Sennebec Pond and one below. The fish spawning in the upper part of the system successfully passed the site where Sennebec Dam once stood and the rock ramp. The dam removal and rock ramp were completed in 2002.

4. Meetings

ASC staff updated the St. George TU Chapter on the habitat survey conducted in 2003 with their help. The surveys encompassed habitat the entire mainstem St. George River, approximately 42 km, documented a total of 1,624 rearing units ($100m^2$).

TUNK STREAM

Tunk Stream is located in Hancock and Washington Counties. It originates at Tunk Lake and flows approximately 26 km to Gouldsboro Bay in Steuben. Spring River Lake is another major lake in the drainage. The Atlantic salmon population is believed to be extinct. Salmon were present in Tunk Stream at least through the 1980s. The proximity of Tunk Stream to the Narraguagus River, as well as other Downeast salmon rivers, and its history as a self-sustaining salmon river, make it a candidate for experimental introductions. Tunk Stream lies within the Distinct Population Segment defined in the 2000 Endangered Species Act listing of Maine Atlantic salmon. However, Tunk Stream was not one of the eight rivers specifically listed. The ASC conducted the following enhancement and management activities on Tunk Stream in 2004.

1. Population Monitoring

Adult Weir Operations, Electrofishing, and Redd Counts

No monitoring of salmon on Tunk stream is currently conducted because the Atlantic salmon population is believed to be extinct**.**

2. Population Enhancement

Stocking and Broodstock Collection

No population enhancement activities are conducted on Tunk Stream by the ASC at this time**.**

3. Habitat

Habitat Survey

The Tunk Stream habitat survey was completed in 2003. The data was processed and audited in 2004. The data will be released with other GIS salmon habitat data by spring 2005. Future

management or research will depend upon knowledge of the habitat in Tunk Stream. This habitat survey will be useful in future decision-making regarding Atlantic salmon management in Tunk Stream.

Water Quality

Tunk Stream has been added to rivers that will have water temperature monitored. The ASC will monitor water temperature in the lower reach of Tunk Stream. This will complement temperature monitoring efforts in the upper river conducted by the Friends of Tunk organization.

4. Public Meetings and Outreach

ASC staff attended meetings of or engaged in activities with the Downeast Watershed Coalition, Downeast Salmon Federation, and Project SHARE. ASC staff are in communication with the group Friends of Tunk which is involved in environmental monitoring and other activities on Tunk Stream. All of these organizations work on salmon habitat and riparian habitat issues in the Tunk Stream watershed.

UNION RIVER

The Union River is the 19th largest river in Maine, draining 500 square miles of Hancock and Penobscot Counties before entering the sea in downtown Ellsworth. During the 1980's Atlantic salmon management in the Union drainage consisted of an annual smolt stocking and adult broodstock collection program. This program was discontinued after 1990, due to a lack of resources and unfavorable results. The current Union River fisheries management program is a cooperative effort between the United States Fish and Wildlife Service (USFWS), the Pennsylvania Power and Light Company (PPL), Union River Association (USA), the City of Ellsworth, the Maine Dept. of Inland Fish and Wildlife (MDIFW), and the Maine Atlantic Salmon Commission (ASC). The following management activities were undertaken in 2004.

1. Population Monitoring

Adult Trap Operations

Ellsworth Dam. The Ellsworth dam is 65 feet in height and is not equipped with an upstream fishway. The current dam owners, PPL, meet fish passage requirements by trapping fish below the dam and transporting them in tank trucks to upriver release sites. The trap is owned by the ASC, but is operated from mid-May to mid-June by commercial fishermen who are permitted to harvest a portion of the alewives entering the trap. The PPL operates the trap for the remainder of the season (June – November) to provide passage opportunity for Atlantic salmon. The alewife run in 2004 increased to 193,523 fish and PPL successfully transported the target-spawning escapement (104,220 alewives) to upriver spawning areas. No salmon were observed during the spring alewife harvest in 2004.

The primary objective of operating the Union River trap-and-truck salmon program is to transport returning adult salmon upriver past two impassable dams and into suitable spawning habitat where they may contribute to juvenile recruitment. Secondary objectives include collection of biological data and monitoring of marked recaptures from study groups. Standard

ASC protocol dictates that trap-and-truck operations for salmon must be suspended to reduce fish-health risks when the water temperature at the release site exceeds 22°C. The ASC recommended that trapping (but not trucking) should continue when river temperature exceeded the 22°C threshold at the Union trap in 2002, 2003, and again in 2004 to gain insight into trapping success and fish behavior during periods of high river temperature. The Union River is not currently stocked with Atlantic salmon and only two adult salmon were captured at the trap in 2004. The first fish was captured on June 23. An experienced PPL biologist tending the trap designated that fish as a likely aquaculture escapee or hatchery origin fish based on observed fin deformities (which are associated with captive rearing). There are currently no hatchery smolts stocked in the Union River and because the origin could not be confirmed on-site, the fish was presumed an aquaculture escapee, sampled, and released below the dam following standard ASC protocol. The fish was recaptured and re-released one more time in 2004. Labratory analysis of the scale growth patterns from this fish indicate that it was stocked as a hatchery smolt, possibly in the Penobscot or Dennys River, and had strayed as an adult into the Union River trap. The typical straying rate for adult salmon to non-natal rivers in Maine is 5% based on historical tag return data. The second fish was a wild salmon returning to the Union River and was trucked upriver and released near suitable spawning habitat. No aquaculture escapees were observed in the Union River in 2004.

2. Population Enhancement

Stocking

Juvenile Salmon. The Union River Salmon Association (USA) is private conservation group that owns and operates a hatchery to produce Atlantic salmon fry for stocking the Union River. This hatchery is currently the only source of fry for the Union River, but a series of water quality issues have prevented fry production since 2000. The USA expanded their hatchery in 2004 and installed a new sand filtration system to address excessive dissolved iron content in the hatchery water supply (lower Union River). A trial run of the new system was undertaken in the fall of 2004 using 50,000 surplus lake trout eggs provided by the MDIFW. The lake trout fry were successfully incubated and hatched, but unfortunately began dying immediately after hatching. Scientists from the University of Maine Center for Cooperative Aquaculture Research in Franklin, ME aided the USA and diagnosed fungal infection of the fry's gills as the cause of mortality. Consequently the USA did not request Atlantic salmon eggs for the 2004-2005 incubation season and are now attempting to resolve the water quality and fry mortality issues at the hatchery.

3. Habitat

Habitat data collected for the West Branch in 2001 are currently being processed for incorporation into the statewide salmon rearing habitat database. No additional habitat surveys were conducted in 2004.

4. Redd Counts

Only one adult salmon was present to spawn in the Union River in 2004 and no redd counts were conducted.

ATLANTIC SALMON COMMISSION ADVISORY PANEL

The executive director, with the approval of the board, shall designate panels of advisors to meet periodically to assist in the development of plans and programs for the protection, preservation, enhancement, restoration and management of Atlantic salmon for each of the river basin complexes that represent the historic range of Atlantic salmon in the State.

To date the Advisory Panel (AP) has been underutilized. The new executive director has begun to rectify this problem. The members have been contacted and vacancies will be filled. The first meeting of the AP will be held in early February of 2004. From this point the AP will meet a minimum of three times annually. Additional meetings shall be called as needed by the Executive Director or ASC Board.

ASC Advisory Panel

First Name	Last Name	Organization Name	Address	City
GARY	ARSENAULT	EDDINGTON SALMON	648 STREAM RD	WINTERPORT
JOHN	BANKS	DEPT OF NATURAL RES	6 RIVER RD	INDIAN ISLAND
MIKE	BUTLER	COVE BROOK WC	261 STILLWATER AVE	OLD TOWN
KEN	CASTNER	SACO SALMON CLUB	12 ANNES WAY	KENNEBUNK
SCOTT	DICKERSON	DUCKTRAP COALITION	101 MT BATTIE STREET	CAMDEN
JO	EATON	PENOBSCOT RIVER	33 HOWARD ST	OLD TOWN
TIM	FOSTER	VEAZIE SALMON CLUB	87 SHIRLEY ROAD	OLD TOWN
MIKE	HERZ	SHEEPSCOT VALLEY C A	PO BOX 274	ALNA
BOB	HINTON	DENNYS RIVER W C	54 BOARDMAN ST	CALAIS
BILL	NICHOLS	12 SPRUCE ST	CUMBERLAND	FORESIDE
GREG	PONTE	ANDROSCOGGIN W C	86 MEAD POINT ROAD	WEST
GARY	SEWELL		262 LAKE ROAD	MONTICELLO
DONALD	SPRANGERS	E MACHIAS WATERSHED	HCR 69 BOX 16	E MACHIAS
TOM	WHITING	TROUT UNLIMITED	PO BOX 218	CAMDEN
BARBARA	WITHAM	UNION SALMON ASSOC	61 BIRCHLAWN DRIVE	LAMOINE
GERRY	ZEGERS	MACHIAS W C	26 BROADWAY	MACHIAS

MAINE ATLANTIC SALMON COMMISSION

SALMON BOARD MEMBERS

Roland D. Martin, Commissioner
Dept. of Inland Fisheries & Wildlife
SHS #41, Augusta, ME 04333-0041
(207) 287-5202 Fax: 287-6395
Email: r.dan.martin@maine.gov

George LaPointe, Commissioner
Dept. Marine Resources
SHS #21, Augusta, ME 04333-0021
(207) 624-6553 Fax: 624-6024
Email: george.lapointe@state.me.us

Richard Ruhlin, (Chair)
115 Elm Street, Brewer, ME 04412
H: (207) 989-7333
Email: sendick20@cs.com

SALMON COMMISSION STAFF

Atlantic Salmon Commission Main Office
323 State Street
172 State House Station
Augusta, ME 04333-0172
(207) 287-9972 Fax: (207) 287-9975

Patrick C. Keliher, Executive Director …287-9973
60 Sawyer Road, New Gloucester, ME 04260
Home: (207) 926-5594
Email: Patrick.keliher@maine.gov
Cell: 557-2562

Melissa Laser, Planning & Research Associate..
Phone: 287-4436
600 Riverside Drive, Augusta, ME 04330
Home: (207) 62-3660
Email: Melissa.Laser@maine.gov
Cell: 448-9059

Kathleen Brosnan, Secretary …….287-9972
25 Lakehurst Acres, Manchester, ME 04351
Cell: (207) 215-9948
Email: Kathleen.Brosnan@maine.gov

Atlantic Salmon Commission Sidney Office
270 Lyons Rd.
Sidney, ME 04330
(207) 547-5326 Fax: (207) 547-4035

Paul Christman, Fisheries Biologist ….547-5326
2005 Hallowell Rd, Litchfield, ME 04350
Home: (207) 268-3725
Cell: (207) 557-9169
Email: paul.christman@maine.gov

Kevin Dunham, Biologist Specalist……547-5328
17 Leonard's Mill Rd., Bradley, ME 04411
Home and Cell Phone: (207) 478-0100
E-Mail: Kevin.dunham@maine.gov

Dan McCaw, Conservation Aide
673 Old Ferry Road, Hartland, ME 04943
Home: (207) 938-2417….
Cell: (207) 557-6062
E-Mail: dan.mccaw@maine.gov

Atlantic Salmon Commission Jonesboro Office
Route 1A, PO Box 178, Jonesboro, ME 04648
(207) 434-5920 Fax: (207) 4345923

Greg Mackey, Fishery Scientist ……434-5920
RR 1 Box 154, Columbia Falls, ME 04623
Home (207) 483-2995
Email: gmackey@nemaine.com
Cell: 461-8812

Ernie Atkinson, Fishery Biologist…… .434-5920
HCR 69, Box 332, Cutler, ME 04626
Home (207) 259-2161
Email: ernestatkinson@nemaine.com
Cell: 461-9784

Mike Loughlin, Biologist Specalist……434-5920
1997 State Highway, Rte. 193, Beddington, ME 04622
Home: (207) 638-2258
E-Mail: mike.Loughlin@maine.gov

Justin Stevens, Biologist Specalist
37 Beech Grove Rd., Corinth, ME 04427
Home: 285-7542
E-mail: Justin.stevens@maine.gov

Jason Czapiga, Conservation Aide
PO Box 3624, Brewer, ME 04412
Home: 843-7978
E-mail: Jason.Czapiga@maine.gov

Atlantic Salmon Commission Bangor Office
650 State St.
Bangor, ME 04401
(207) 941-4449 Fax:(207) 941-4443

Joan Trial, Senior Biologist …….941-4452
6 Birch Bark Lane, Argyle Twp., ME 04468
Home: (207) 394-2655
Cell: (207) 949-2656
Email: joan.trial@state.me.us

Heidi Morgan, Secretary……..941-4449
1148 Eastern Ave, Holden, ME 04429
Home: 989-8399 (Unlisted)
E-Mail: heidi.morgan@maine.gov

Norm Dube, Fisheries Scientist ……941-4453
2057 Skyway Valley, Hermon, ME 04401
Cell: 557-9194 Home: (207) 848-3033
Email: norm.dube@maine.gov

Randy Spencer, Fisheries Biologist ……941-4454
17 Canoe Club Rd., Hampden, ME 04444
Home: (207) 862-3867
Cell (207) 461-8813
Email: randy.spencer@maine.gov

Peter Ruksznis, Fisheries Biologist …..941-4460
PO Box 591, Guilford, ME 04443
Home: (207) 478-5229
Cell: (207) 577-6062
Email: peter.ruksznis@maine.gov

Mitch Simpson, Fisheries Biologist ……941-4464
132 Reynolds Road, Brooks, ME 04921
Home: (207) 772-3908
Email: mitch.simpson@maine.gov
Cell: 461-8814

Richard Dill, Biology Specialist ……..941-4487
20 Bryer Heights, Milford, ME 04461
Home: (207) 827-8553
Email: richard.dill@maine.gov

Atlantic Salmon Commission Seasonal Staff
Cons. Aid (Bangor HQ)
(207) 941-4449
Cons. Aid (Jonesboro)
(207) 434-5920